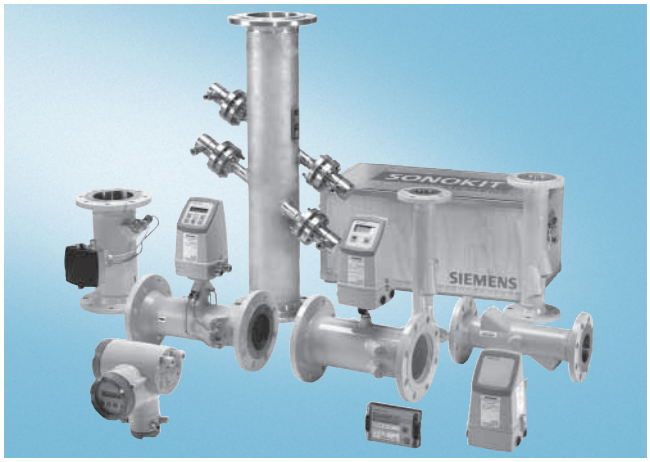
SITRANS F US

System info and selection guide
Ultrasonic flowmeters

Overview

Siemens offers two types of ultrasonic flowmeters, wetted flowmeters and clamp-on flowmeters. This offers the end user the maximum flexibility to choose the technology that best fits his needs.



SITRANS F US SONOFLO wetted ultrasonic flowmeters measure flow of electrically conductive and non-conductive liquids.

Application

Wetted ultrasonic flowmeters are suitable for measuring the flow of almost all conductive and non-conductive liquids.

- max. 2% solids
- max. 2% air and gas
- max. 350 cSt

The main applications can be found in the following sectors:

- Raw water intake for water treatment plants
- Treated waste water
- Power generation and utility
- Oil and gas industry and petrochemical industry
- Irrigation systems
- Cooling water plants within the industry and in power stations
- Plants transporting non-conductive liquids
- HART / 4 ... 20 mA output
- PROFIBUS PA
- ATEX

Benefits

The SITRANS F US ultrasonic wetted flowmeters are used to measure homogeneos conductive and non-conductive liquids.

- Sensor sizes from DN 50 to 1200 mm (2“ to 48“)
- Wetted retrofit as 1 and 2 track up to DN 4000 (160“)
- Dedicated transmitter portfolio for HVAC, general industry as well as more demanding applications
- Custody transfer approvals within district heating
- Compact and remote transmitter installation
- Comprehensive self-diagnostic for error indication and logging
- Exchange of the transducers without interrupting operation
- HART and PROFIBUS PA communication
- ATEX

SITRANS F US clamp-on ultrasonic flowmeters provide highly accurate measurement of liquids and gases while minimizing installation time and maintenance expense.

Application

Clamp-on ultrasonic flowmeters have six product families:

FUS1010 and FUP1010 General purpose flowmeters are suitable for a wide variety of liquid applications, including:

- Water and wastewater: raw water, potable water, sludges, chemicals, raw sewage, effluent and mixed liquor
- HVAC: chillers, condensers, hot & cold water systems
- Power: nuclear, fossil, hydroelectric
- Processing: process control, batching, rate indication, volumetric and mass measurement

FUE1010 Energy flowmeters are ideally suited to thermal energy/power industry applications, including:

- Chilled & hot water sub-metering
- Condenser water, potable water
- Glycol and brine solution, thermal storage

FUH1010 Hydrocarbon flowmeters are ideal for applications carrying crude oil, refined petroleum or liquefied gas:

- Interface detectors / density meters
- Viscosity compensated volumetric flowmeters
- Standard volume (net) mass flowmeters

FUG1010 Gas flowmeters suit most natural and process gas applications, including: checkmetering, allocation, flow survey verification, lost & unaccounted for (LAUF) analysis, production, storage.

FUS1020 Basic flowmeters are suitable for many clean liquid applications in the water & wastewater, chemical feed, HVAC and power industries.

Benefits

- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning - and no moving parts to wear or foul
- No pressure drop or energy loss - and wide turn-down ratio
- Single, dual or multiple channel versions and a variety of enclosures - to suit your operating conditions and requirements

		SONO 3300/3000 Industry	**SONO 3100/ FUS060 Industry**	**SONOKIT retrofit**	**SITRANS FUS380/ SONOCAL 3000**	**SITRANS FUS880**
Industry						
Water, treated waste water,		●	●	■		
Utility, district heating water, cooling		●	●	▲	■	
Utillity, district heating, approvals required					■	
Irrigation		●	●	▲	▲ 4)	■
HPI, Oil & liquid gas		■	■	●		
Chemical		●	●			
Cryogenic fluids			●			
Offshore, 2- and 4-track			▲			
Design						
Pipe/electronic calibrated on test rig		●	●		●	
Replaceable transducers under pressure			●	●		
Retrofit on existing steel pipes/concrete/ non weldable pipes/hot tap				●		●
Compact		●			● 4)	
Separate		●	●	●	●	●
Transmitter type		**SONO 3000**	**FUS060**	**FUS060**	**FUS080**	**FUS080**
Dimension						
DN 50	2"	●			● 3)	
DN 65	2½"	●			● 3)	
DN 80	3"	●			● 3)	
DN 100	4"	●	●		●	
DN 125	5"	●	●		●	
DN 150	6"	●	●		●	
DN 200	8"	●	●	●	●	●
DN 225	9"	●	●	●	●	●
DN 250	10"	●	●	●	●	●
DN 300	12"	●	●	●	●	●
DN 350	14"		●	●	●	●
DN 400	16"		●	●	●	●
DN 500	20"		●	●	●	●
DN 600	24"		●	●	●	●
DN 700	28"		●	●	●	●
DN 800	32"		●	●	●	●
DN 900	36"		●	●	● 3)	●
DN 1000	40"		●	●	● 3)	●
DN 1200	48"		● 1)	●	● 3)	●
DN 4000 max.	160“			●		
Number of tracks						
1-track				●		●
2-track		●	●	●	●	●
4-track (on request)			●	●		
Flanges Norm						
EN 1092-1		●	●		●	
EN 1759-1		●	●			
ANSI B16.5						
Flangeless version			●			

● = can be used, ▲ = often used, ■ = most often used

1) Bigger sizes on request

2) FUS380: 87 ... 250 V AC

3) SONOCAL 3000

4) FUS080

System info and selection guide
Ultrasonic flowmeters

		SONO 3300/3000 Industry	**SONO 3100/ FUS060 Industry**	**SONOKIT retrofit**	**SITRANS FUS380/ SONOCAL 3000**	**SITRANS FUS880**
Pressure rating						
PN 6			●	●		●
PN 10		●	●	●	● [3]	
PN 16		●	●	●	●	
PN 25			●	●	●	
PN 40		●	●	●	●	
Class 150		●	●			
Class 300		●	●			
PN 160			●			
Class 2500			●			
Pipe and flange material						
Carbon steel		●	●		●	
Stainless steel			●			
Other materials on request			●			
Hot zinc galvanised						
Temperature range						
°C	°F					
-200	-330		**O**			
-20	-4		●	●		
-10	+14	●	●	●	● [3]	
0	+32	●	●	●	●	●
+50	+120	●	●	●	●	●
+120	+250	●	●	●	●	
+160	+320	●	●	●	●	
+200	+390		●	●	●	
+250	+482		**O**			
Power supply						
Battery					● [4]	●
AC 115 … 230 V		●	●	●	● [2]	
DC 24 V		●	●	●		
National approvals						
OIML R 75 (Heat meter approval)					●	
EN 1434 class 2 (Heat meter approval)					● [4]	
Country specific type approval available					●	
EEx-d		●				
EEx ATEX			●	●		
Others						
Display with keypad		●	●	●	● [4]	●

● = can be used

O = special transducers

[1] Bigger sizes on request

[2] FUS380: 87 ... 250 V AC

[3] SONOCAL 3000

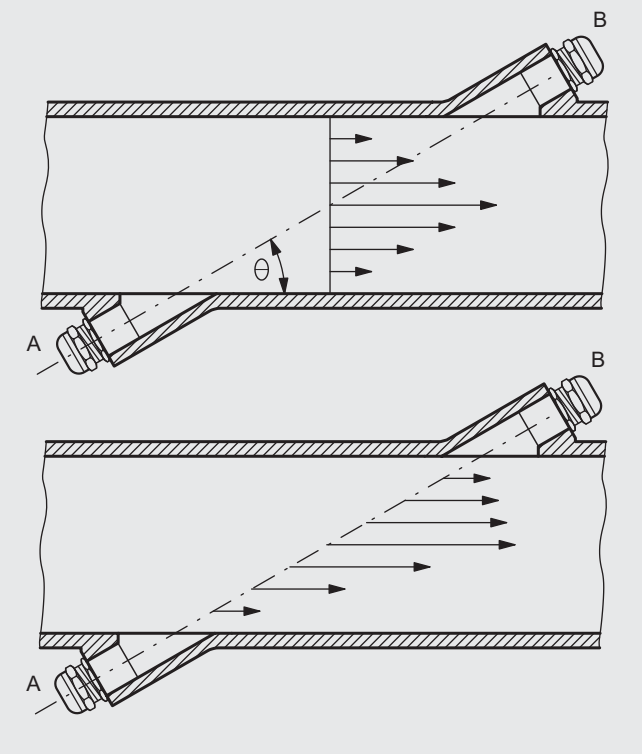
[4] FUS080

Function

Direct signal processing

In the SITRANS F US SONOFLO ultrasonic flowmeter program the signal is sent directly and without deflection to the bore wall from the transmitter to the receiver. The advantage gained sending signals from point to point is an extremely good signal strength for the signal processing avoiding a suddenly flowmeter stop.

Physical principle



Velocity distribution along sound path

A sound wave traveling in the same direction as the liquid flow arrives at point B from point A in a shorter time than the sound wave traveling against the direction of flow (from point B to A). The difference in sound transit time indicates the flow velocity in the pipe.

Since delay time is measured at short intervals both in and against flow direction, viscosity and temperature have no influence on measurement accuracy.

Measuring principle

In SITRANS F US SONOFLO flowmeters the two ultrasonic transducers are placed at an angle θ in relation to the pipe axis. The transducers function as transmitters and receivers of the ultrasonic signals. Measurement is performed by determining the time the ultrasonic signal takes to travel with and against the flow. The principle can be expressed as follows:

$$v = K \cdot (t_{A,B} - t_{B,A}) / (t_{A,B} \cdot t_{B,A}) = K \cdot \Delta t/t^2$$

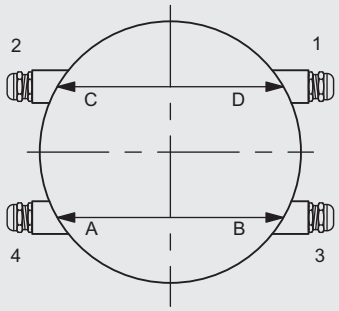
v = Average flow velocity
t = Transit time
K = Proportional flow factor

This measuring principle offers the advantage that it is independent of variations in the actual sound velocity of the liquid, i.e. independent of the temperature. Proportional factor K is determined by wet calibration.

Ultrasonic flow metering based on battery

Siemens offers a solution based on a 3.6 V lithium cell battery with a lifetime of up to 8 years. As the electronics is optimised to operate at extremely low power consumption, the electronics is limited in function and services. The battery powered ultrasonic flowmeter finds its application mainly in power generation, utility and irrigation where mains supply is out of reach.

Pipe geometry with 2-track solution



The accuracy of all flowmeters static or mechanical depends on the pipe geometry before and after the flowmeter and the number of ultrasonic measuring tracks.

When water flows through a pipe, it has a tendency to swirl and/or flow with different velocities inside the pipe, depending on the pipe design.

Therefore 2-tracks or more is the most reliable technology today.

2-track systems offer

- less sensitivity to upstream obstruction like bends, pumps or valves.
- high security in the measurements as the meter continues to measure even if, for some reason, one track stops working.

Typical straight inlet requirements are upstream 10 x D_i (D_i = diameter of the flowmeter) and downstream 3 x D_i.

Typical accuracy that can be reached with 2-track ultrasonic flow metering is ±0.5% with installations according to above demands.

4-track ultrasonic flowmeters

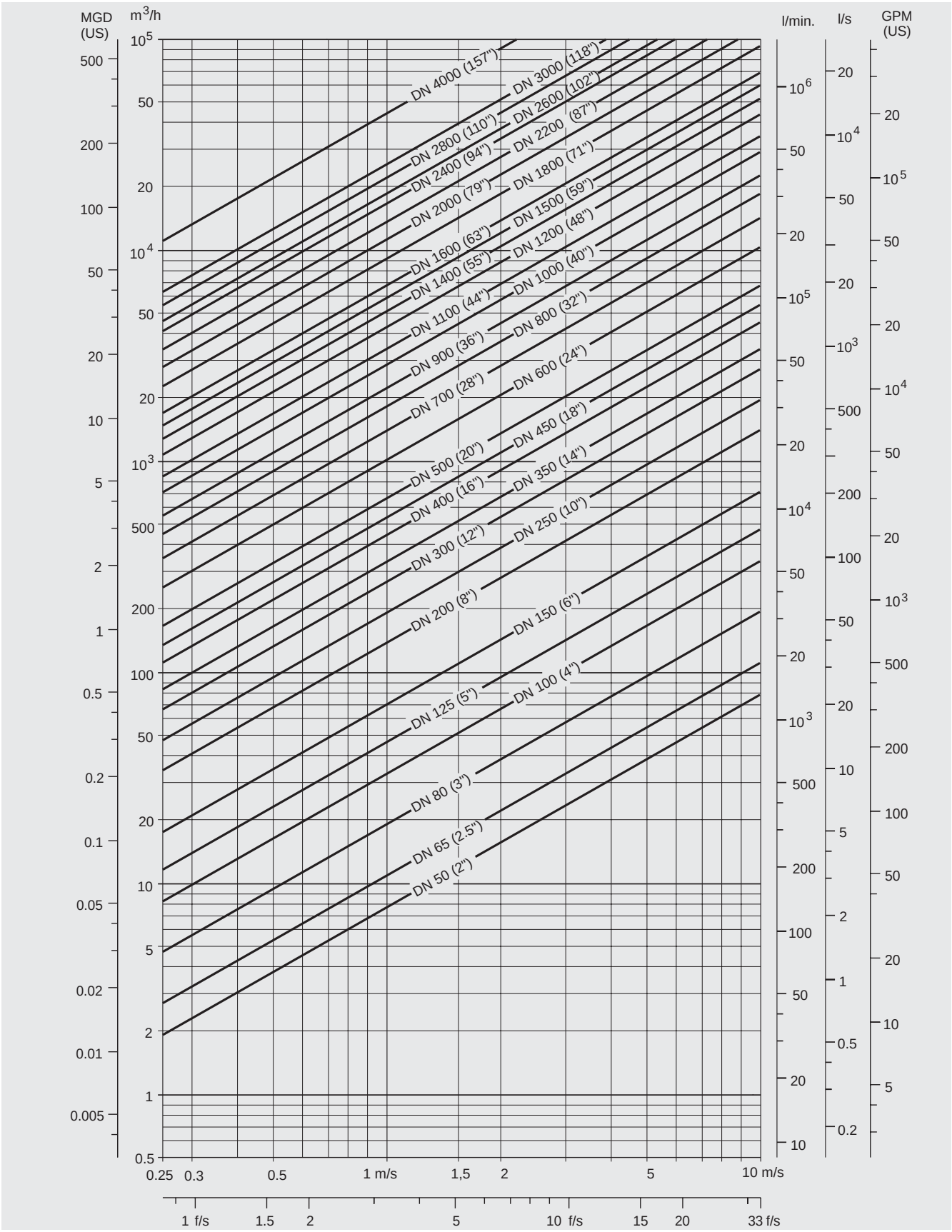
Some applications require accuracy under extreme short inlet conditions and swirl that cannot be obtained with 2-track solutions.

For these applications we can offer a 4-track solution – customer specified – according to actual inlet conditions.

Please contact Siemens Flow Instruments for specific applications.

4

Technical specifications



Nominal size and flow

Guidelines for selection of sensor

Min. measuring range: 0 … 0.25 m/s

Max. measuring range: 0 … 10 m/s

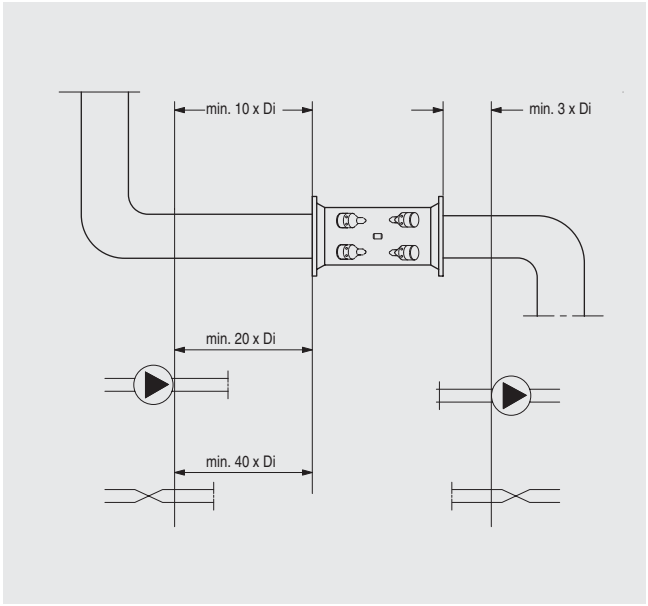
Normally the sensor is selected so that nominal flow velocity is within the measuring range 3 … 5 m/s.

Flow velocity calculation formula:

$v = (4 \times Q_{max}) / (\pi \times D_i^2 \times 3600)$

v in m/s, Q_{max} in m^3/h, D_i in m

Inlet and outlet



Recommended inlets and outlets

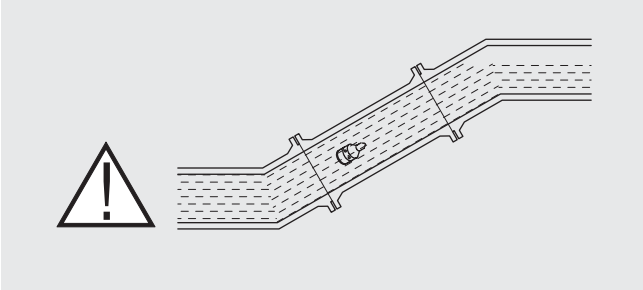
To maximize performance inlet and outlet must be straight. There must be a certain distance between flowmeter and bends, pumps and valves. It is also important to centre the flowmeter in relation to pipe flanges and gaskets.

Valves must always be installed after the flowmeter. The only exception is installation of the sensor in a vertical pipe. In this case a valve below the sensor is necessary to allow zero point adjustment. It is important to select a valve which does not alter the flow when fully open.

Recommended inlet/outlet

	SONO 3300/3100 SONOKIT 2-track	SONOCAL 3000 2-track SITRANS FUS380	SONOKIT 1-track
90° bend	10 x D_i	10 x D_i	20 x D_i
Fully opened valve	10 x D_i	10 x D_i	20 x D_i
Partially opened valve	40 x D_i	40 x D_i	40 x D_i
2 x 90° bends in same plane	15 x D_i	10 x D_i	25 x D_i
2 x 90° bends in two planes	20 x D_i	20 x D_i	40 x D_i
Outlet	3 x D_i	3 x D_i	3 x D_i

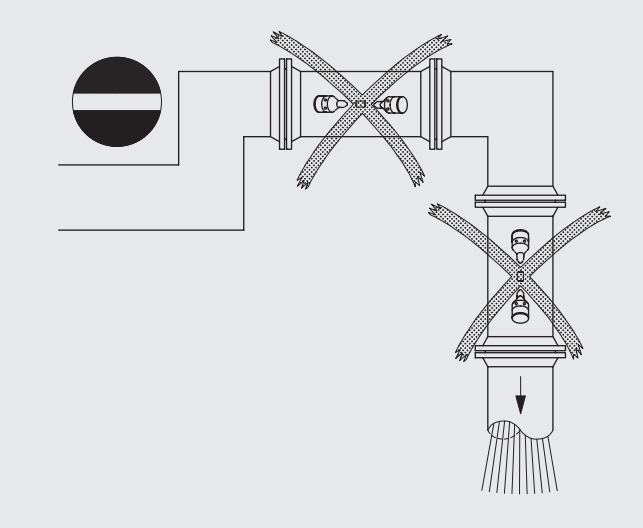
The sensor must always be completely filled with liquid.



Install in completely filled pipes

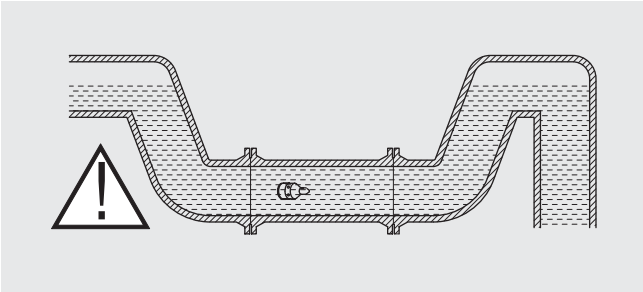
The following installations should be avoided:

- Installation at the highest point of the pipe system
- Installation in vertical pipes with free outlet



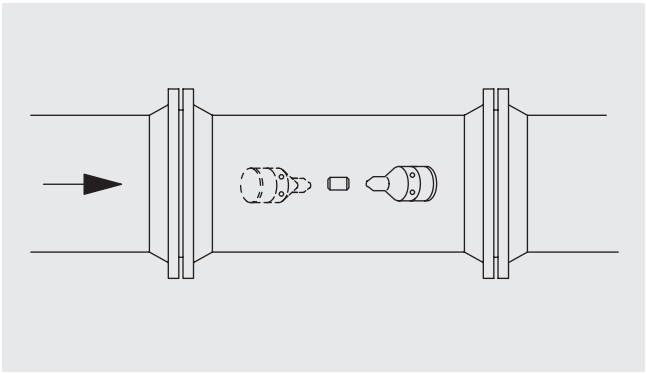
Do not install at the highest point or in vertical pipes with free outlet

With partially full pipes or pipes with free outlet the flowmeter should be located in a U-shaped tube.



Install in U-shaped tube if pipe is partially filled

Installing the transducers in horizontal position is recommended.



Install transducer in horizontal position

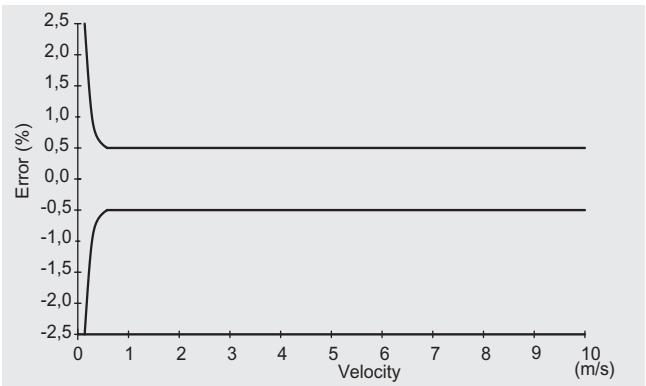
To ensure maximum accuracy sensor and transmitter must be calibrated together.

SONO 3000 consists of an electronic device and a separate SENSORPROM. Flowmeter calibration data are stored in the SENSORPROM, and in the internal EPROM. The SENSORPROM contains all necessary information for a quick startup.

The system accuracy refers to the following systems:

SONO 3300/3000, SONO 3100/FUS060.

Reference conditions



Fluid	Water
Fluid temperature	22 ± 5 °C
Ambient temperature	22 ± 5 °C
Supply voltage	AC 115/230 V +10 … -15% DC 24 V +25 … -15%, AC 24 V ± 15%
Straight inlet length	20 x D_i
Rangeability	0 … 1 m/s to 0 … 10 m/s
Repeatabilty	Better than 0.25% in the range 0.5 … 10 m/s
Linearity	
• Reynolds number 1000 < Re < 5000	Better than 1%
• Reynolds number > 5000	Better than 0.5%

Additional effects of deviations from reference conditions

- Current output: As frequency output ±(0.1% of actual flow +0.05% FSO)
- Effect of ambient temperature: Frequency/pulse output: < 0.005% SPAN/K
- Current output: < ± 0.0075% SPAN/K
- Effect of supply voltage: 0.005% of measuring value at 1% change

Overview

SONO 3000 is a transit time based transmitter designed for ultrasonic flowmetering on any pipe in the SONO series up to DN 4000.

SONO 3000 is a microprocessor based transmitter engineered for high performance, easy installation, commissioning and maintenance, suitable for 1, 2 or 4 track flowmeters.

Benefits

- Superior signal resolution for optimum turn down ratio
- Unique correlation signal ensures realiable signal detection
- Digital processing with many possibilities
- Automatic reading of SENSORPROM data for easy commissioning
- User configurable operation menu with password protection
- Multiple functional output for process control, minimum configuration
- Pulse/frequency and relay output (status, flow direction, limits)
- Comprehensive self diagnostic for error indication and error logging

Application

The SONO 3000 ultrasonic transmitter is suitable for processing the flow of any conductive or nonconductive liquids with max. 2% solids, 2% air and gas and a viscosity of max. 350 cSt.

The main application can be found in:

- Water and waste water industries
- Chemical and pharmaceutical industries
- District heating applications
- Cooling water plants
- Oil and refinery
- Cryogenics
- Utility

Design

The transmitter is available in 2 different enclosure to fit any demands:

- IP67 (NEMA 4X/6) enclosure for compact or wall mounting
- IP65 (NEMA 4) enclosure in stainless steel for EEx application

Function

Settings are stored automatically in the transmitter and in the SENSORPROM flow memory unit. The values remain stored in the event of power failure and when a transmitter is replaced.

Operation of any key illuminates the display. The light is automatically turned off 10 minutes after last key operation.

Technical specifications

SONO 3000 transmitter

Technical specifications for all versions

Analog output	Individually galvanically isolated, isolation voltage 500 V
Measurement of (optional via menu)	Volume flow
	Sound velocity
Current	0/4 … 20 mA
Load	< 800 Ω
Time constant	0.8 … 30 s, adjustable
Frequency/pulse output	Individually galvanically isolated, isolation voltage 500 V
Measurement of (optional via menu)	Volume flow
	Sound velocity
	Total volume
	Total mass
Frequency	0 … 10 kHz
Time constant	0.8 … 30 s, adjustable
Pulse width	50 µs, 500 µs, 5 ms, 20 ms, 50 ms, 100 ms, 500 ms, 1 s, 5 s
Output mode	
• Active	24 … 30 V DC / 25 mA max. (pulse width : 50 µs … 5 s) (50 ms electromechanical counter, 75 mA max. if f < 1 Hz)
	24 … 30 V DC / 50 mA max. (f: 500 Hz … 10 kHz)
• Passive	5 ... 30 V DC / 200 mA max.
Relay	Change over relay (error indication, flow direction, sound velocity limit)
Load	42 V, 0.5 A
Time constant / Hysteresis	5 s / 0.5% F.S.O.
Cut-off	Low Flow, 0 … 9.9% F.S.O.
Supply voltage and power consumption	115 … 230 V AC +10/-15%, 50 … 60 Hz, 10 … 20 VA
	24 V DC +25/-15%, 24 V AC ± 15%, 10 VA
Internal counters (totalizers)	2, selectable uni- or bidirectional counting (net flow)
Measurement of:	Total volume
Display	Back-lit, alphanumeric, 2 x 16 digit
	For indication of: measured values, totalization, settings, error codes and alarms

SONOFLO SONO 3000 transmitter

Technical specifications (continued)

SONO 3000 transmitter, IP67 (NEMA 4X/6)

SONO 3000 transmitter, EEx-d version, wall mounting

Enclosure IP67 (NEMA 4X/6) to IEC 60529 and DIN 40050

Material	Fibre glass reinforced polyamide
Mechanical vibration	2 g, 1 … 800 Hz, sinusoidal in all directions to IEC 68-2-6
Ambient temperature	
• Operation	-20 …+55 °C (-4 … +131 °F)
• Storage	-40 … +85 °C (-40 … +185 °F)
Dimensions	See dimensional drawing
CE-mark	
• EMC	Emission EN 61000-6-4 Immunity EN 61000-6-2
• Low voltage	According to EN 61010-1
Supply voltage and power consumption	115 … 230 V AC +10/-15%, 50 … 60 Hz, 10 … 20 VA 24 V DC +25/-15%, 24 V AC ± 15%, 10 VA Cable impedance < 7 Ω at 24 V

Enclosure EEx-d version, wall mounting

Separate mounted	IP65 (NEMA 4) to IEC 60529 and DIN 40050
Material	AISI 316 and Duplex
Mechanical vibration	2 g, 1 … 800 Hz, sinusoidal in all directions to IEC 68-2-6
Ambient temperature	
• Operation	-20 … +55 °C (-4 … +131 °F)
• Storage	-40 … +85 °C (-40 … +185 °F)
Dimensions	See dimensional drawing
Weight	ca. 11 kg (24.25 lb)
Supply voltage and power consumption	24 V DC +25/-15%, 24 V AC ± 15%, 10 VA Cable impedance < 10 Ω at 24 V
Description of Ex-approval (no ATEX)	EEx de [ia/ib] II C T6 Flameproof Enclosure “d” Outputs intrinsically safe class “ia” Display/keypad intrinsically safe class “ib” Power and sensor connections are increased safe “e” Separate version: DEMKO No. 94C.113341X
CE-mark	
• EMC	Emission EN 61000-6-4 Immunity EN 61000-6-2
• Low voltage	According to EN 61010-1

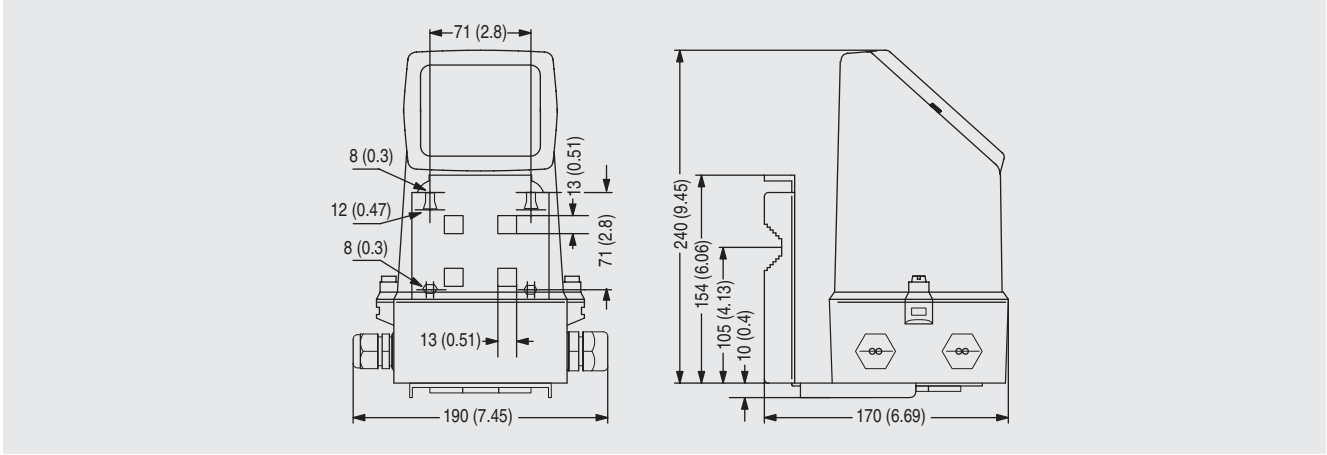
Factory settings

Every transmitter is delivered with a SENSORPROM programmed with default settings according to flowmeter size.

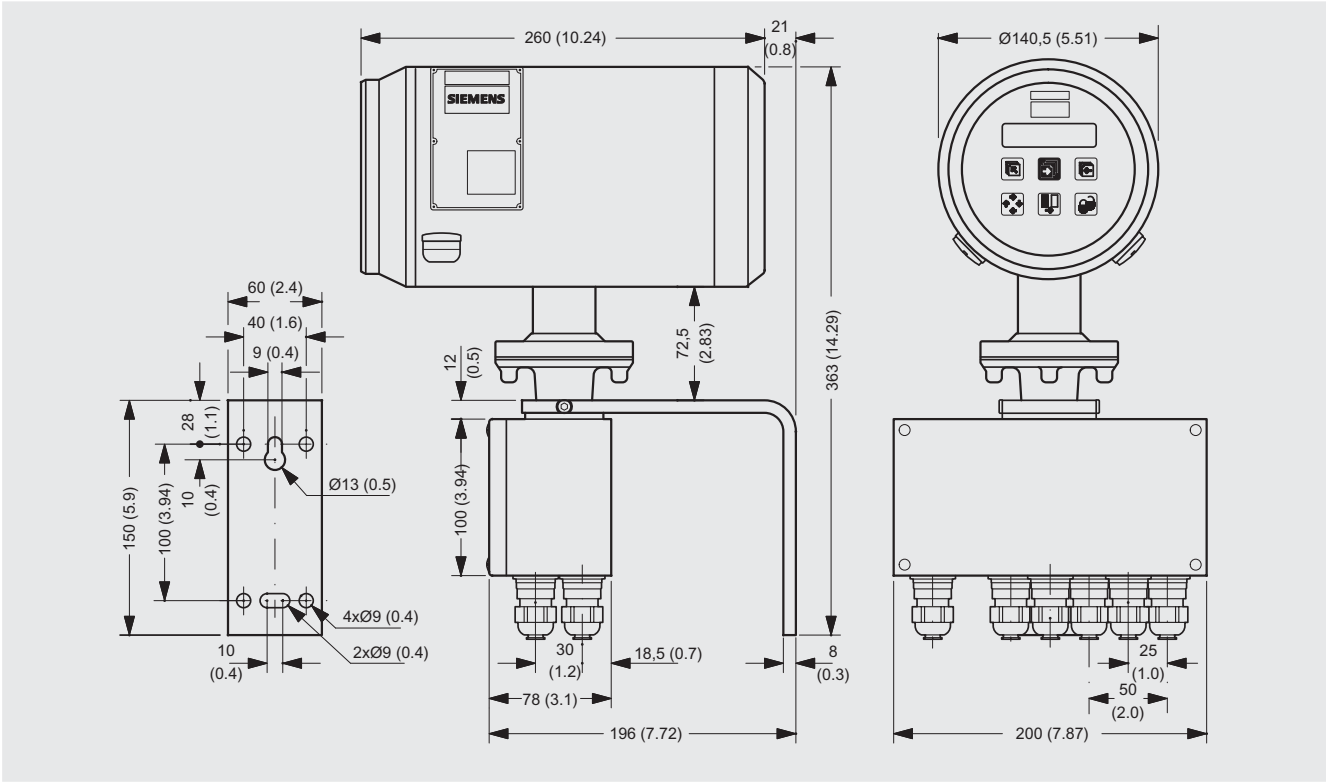
The range for each setting is given. Detailed information see Operating Manual.

Dimensional drawings

Transmitter IP67 for wall mounting



Transmitter IP65 EEx-d

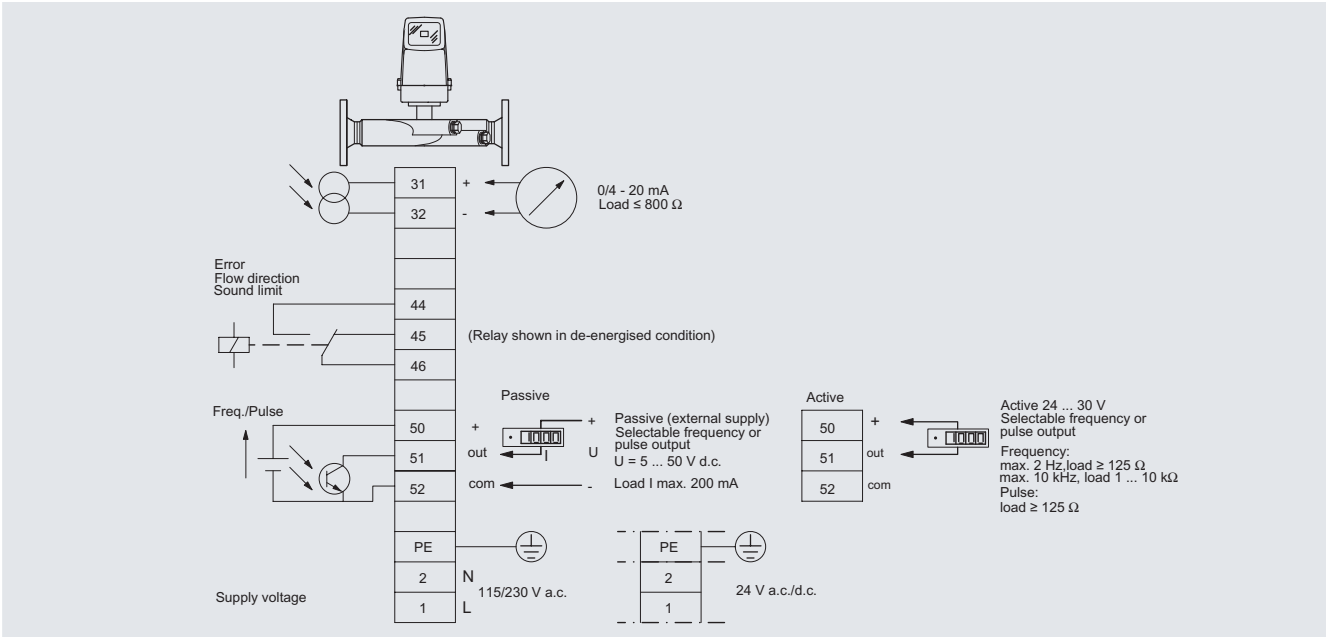


SONOFLO SONO 3000 transmitter

Schematics

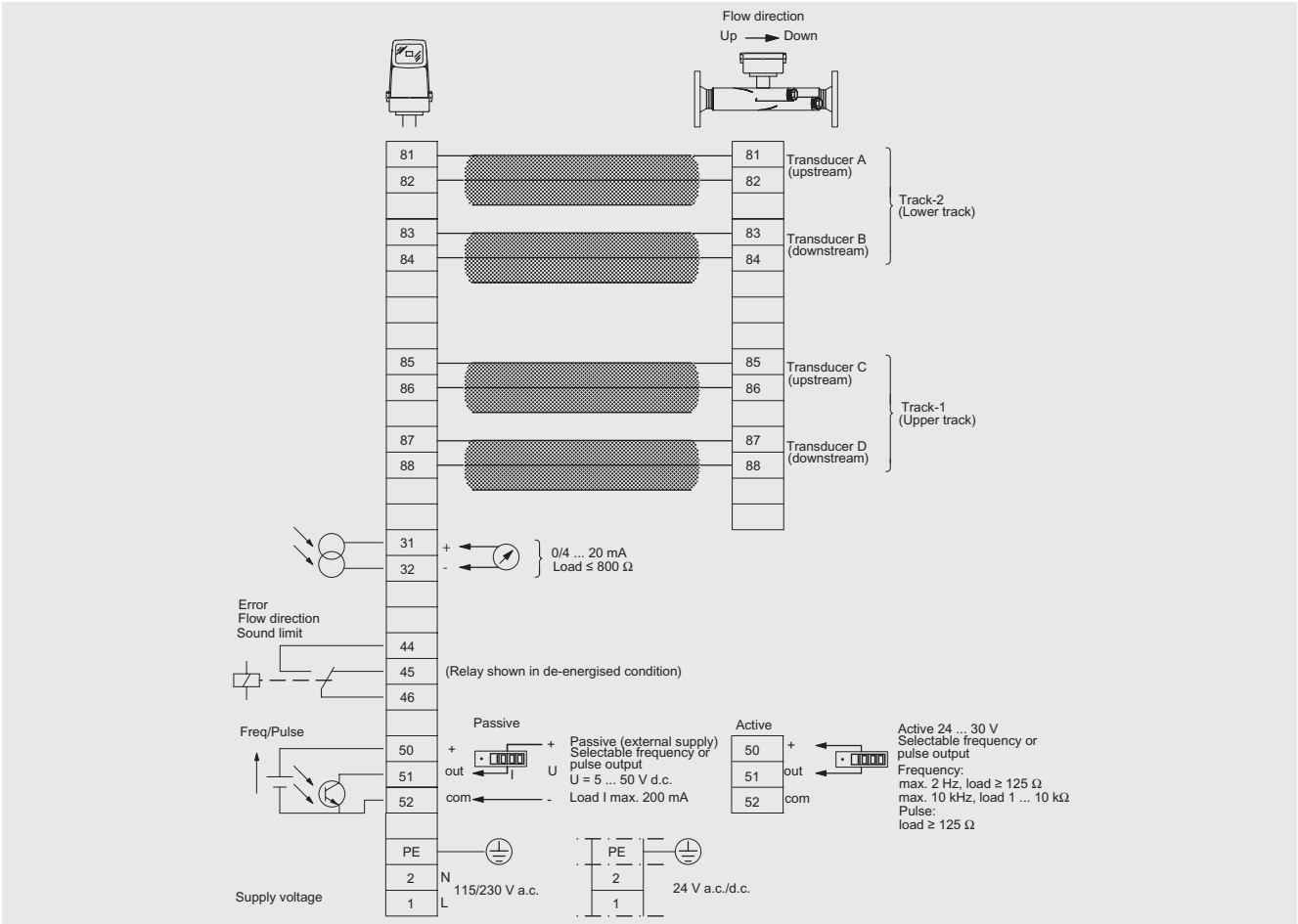
Electrical diagram compact version IP67:

SONO 3000 IP67 compact mounted



Electrical diagram remote version IP67:

SONO 3000 IP67 remote mounted



Connect coax cable to 81, 83, 85 and 87.

Overview

SITRANS FUS060 transmitter

SITRANS FUS060 is a transit time based transmitter designed for ultrasonic flowmetering for any pipe in the SONO series up to DN 4000. SITRANS FUS060 is engineered for high performance and suitable for 1-, 2- and 4-tracks flowmeters.

Benefits

- Superior signal resolution for optimum turn down ratio
- Simple menu-based local operation with two-line display and four optical input elements, for unlimited use in potentially explosive atmospheres
- Self-monitoring and diagnosis
- Operate up to 4-tracks
- ATEX II 2G EEx de IIC T6 (HART version only)
- ATEX II 2G EEx d [ia] IIC T6
- Remote transmitter up to 15 m away
- 1 analog output (4 to 20 mA) with HART-protocol, 1 digital frequency or pulse output, 1 relay output for limit, alarms, flow direction
- PROFIBUS PA Profile 2 add-on module, 1 digital frequency or pulse output

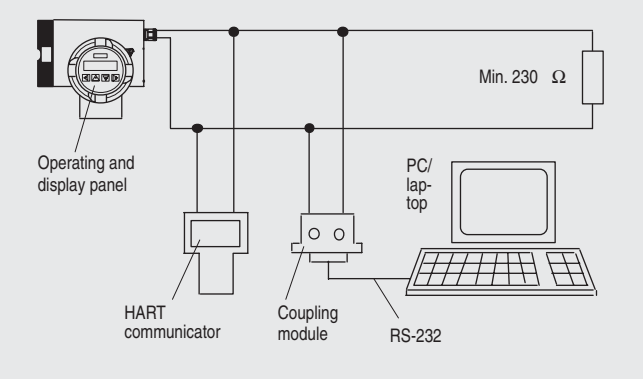
Design

The transmitter is designed for remote installation in non-hazardous or hazardous areas.

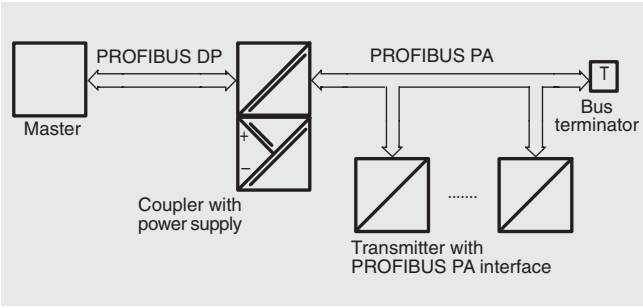
Displays and keypad

Operation of the SITRANS FUS060 transmitter can be carried out using:

- Keypad and display unit
- HART communicator
- PC/laptop and SIMATIC PDM software via HART communication
- PC/laptop and SIMATIC PDM software using PROFIBUS PA communication



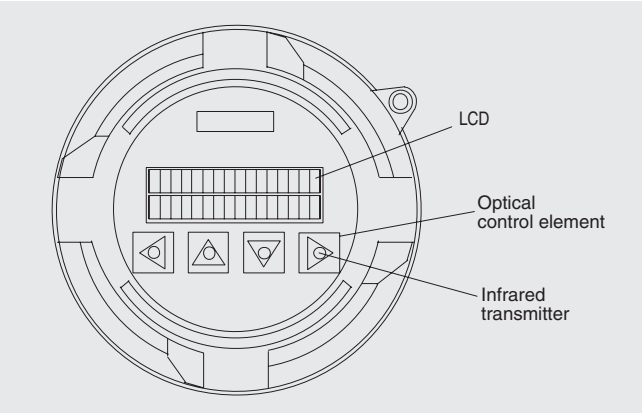
HART communication



PROFIBUS PA communication

Function

The operating and display panel permits simple operation without supplementary equipment. It is not necessary to open the housing. All changes to a setting can therefore also be carried out in the potentially explosive atmosphere.



Operating and display panel

The individual functions and parameters are selected using a hierarchical, multi-language input menu and four optical input elements. The parameters can be specifically selected and modified using codes, e.g.:

SITRANS FUS060 transmitter

- Operating parameters such as measuring range, physical dimensions, device information
- Limits for flow, ultrasonic velocity or ultrasonic amplitude
- Noise suppression using damping, error stages and hysteresis
- Display parameters (freely-configurable display)
- Display in volume or mass dimensions
- Density as constant input value for conversion of volume into mass dimensions
- Forward/backward measurement
- Flow direction
- Diagnostics functions and control values
- Functions of the PROFIBUS PA output:
  flow, net quantity (volume or mass), speed of sound, ultrasonic amplitude, forward quantity (volume or mass), backward quantity (volume or mass)
- Functions of the analog output:
  flow, ultrasonic velocity or ultrasonic amplitude
- Functions of digital output 1:
  pulse output, frequency output or device status
- Functions of digital output 2:
  limit, flow direction or device status
- Simulation of output signal via analog output, digital output 1 and digital output 2

The HART protocol is implemented via the analog output (current output). Using this communication facility, the device can be parameterized with a PC/laptop and SIMATIC PDM software in addition to local operation.

In the SITRANS F version with PROFIBUS PA, the analog output is replaced by the digital PROFIBUS PA output. The device can then be parameterized via PROFIBUS communication and with SIMATIC PDM in addition to local operation.

Technical specifications

Input

Nominal diameters and measuring ranges	2-track DN 50 ... DN 4000
Max. cable length	15 m (49.2 ft) (screened cable)

Output

Analog output	
• Signal range	4 ... 20 mA
• Upper limit	20 ... 22.5 mA, adjustable
• Signal on alarm	3.6 mA, 22 mA, or 24 mA
• Load	Max. 600 Ω; ≥ 230 Ω for HART communication
• Only PROFIBUS PA version:	Analog output omitted, is replaced by digital PROFIBUS PA interface
Digital output 1	
• Active or passive signal, can be configured with positive or negative logic	Active: DC 24 V, ≤ 24 mA, R_i = 300 Ω Passive: open collector, DC 30 V, ≤ 200 mA
• For explosion protection II 2G EEx dem [ib]	Passive: open collector DC 30 V, ≤ 100 mA
• Only PROFIBUS PA version:	Only passive signals for digital output 1
• Output function, configurable	Pulse output • Adjustable pulse significance ≤ 5,000 pulses/s • Adjustable pulse width ≥ 0.1 ms Frequency response • f_{END} selectable up to 10 kHz
Digital output 2	
• Relay, NC or NO contact	Switching capacity max. 5 W Max. DC 50 V, max. DC 200 mA Self-resetting fuse, R_i = 9 Ω
• For explosion protection II 2G EEx d [ib]	Max. DC 30 V, max DC 100 mA, AC 50 mA (cf. EC-Type Examination certificate)
• Output function, configurable	Limit for Flow, speed of sound or ultrasonic amplitude Flow direction Device status
• Only PROFIBUS PA version:	Digital output 2 omitted
Communication via analog output 4 ... 20 mA	
• PC/laptop or HART communicator with SITRANS F flowmeter	
- Load with connection of coupling module	230 ... 500 Ω
- Load with connection of HART communicator	230 ... 600 Ω
- Cable	2-wire screened ≤ 3 km (≤ 1.86 miles) Multi-core screened ≤ 1.5 km (≤ 0.93 miles)
- Protocol	HART, version 5.1
Communication via PROFIBUS PA interface	Layers 1 + 2 according to PROFIBUS PA Communication system according to IEC 1158-2 Layer 7 (protocol layer) according to PROFIBUS DP, EN 50170 standard
• Power supply	Separate supply, four-wire device Permissible bus voltage 9 ... 32 V See certificates and approvals
• Current consumption from bus	10 mA; ≤15 mA in event of error with electronic current limiting
Electrical isolation	Outputs electrically isolated from power supply and from one another

Accuracy

Error in measurement (at reference conditions)	
• Pulse output	V < 0.5 m/s: ± 0.25%
• Analog output	As pulse output plus ± 0.1% of measured value, ± 20 µA
• Repeatability	≤ ± 0.05% of measured value
Reference conditions	
• Process temperature	25 °C ± 5 °C (77 °F ± 9 °F)
• Ambient temperature	25 °C ± 5 °C (77 °F ± 9 °F)
• Warming-up time	30 min.

Rated operation conditions

Ambient conditions

Ambient temperature	
• For transmitter	• -20 ... +65 °C (-4 ... +149 °F) with process temp. ≤ 60 °C (≤ 140 °F) • -20 ... +55 °C (-4 ... +131 °F) with process temp. > 60 °C (> 140 °F)
• For operating panel	0 ... 50 °C (32 ... 122 °F)
• In potentially explosive atmospheres	Observe temperature classes
Storage temperature	-25 ... +80 °C (-13 ... +176 °F)
Degree of protection	IP65
Electromagnetic compatibility	For use in industrial environments
• Emitted interference	To EN 61000-6-4
• Noise immunity	To EN 61000-6-2 and NAMUR

Medium conditions

• Process temperature	-20 ... +180° C (-4 ... +356 °F)
• Gases/solids	Influence accuracy of measurement

Design

Transmitter	
• Separate version	Transmitter is connected to metering tube via 15 m (49.2 ft) long specially screened cable
• Housing material	Die-cast aluminum
Electrical connection	Cable inlet: 2x M20 or 2x ½"-NPT

Displays and controls

Display	LCD, two lines with 16 characters each
• Multi-display: 2 freely-selectable values are displayed simultaneously in two lines	Flow, quantity, flow velocity, speed of sound, ultrasonic amplitude, current, frequency
Operation	4 optical control elements Hierarchical menu prompting with codes

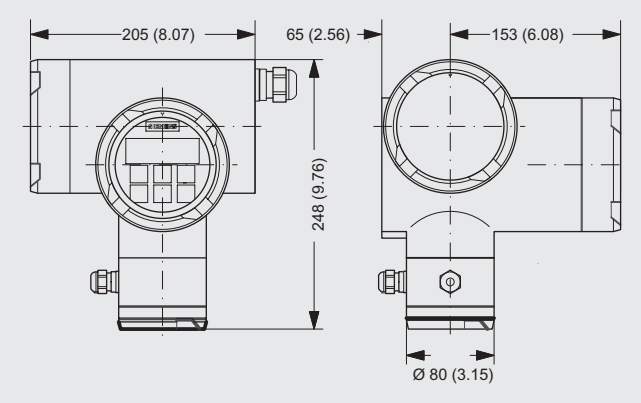
Power supply

Supply voltage	AC 120 ... 230 V ± 15% (50/60 Hz) or DC 19 ... 30 V/ AC 20.4 ... 26.4 V
• Power failure	No effect for at least 1 period (> 20 ms)
• Power consumption	Approx. 8 VA / 6 W

Certificates and approvals

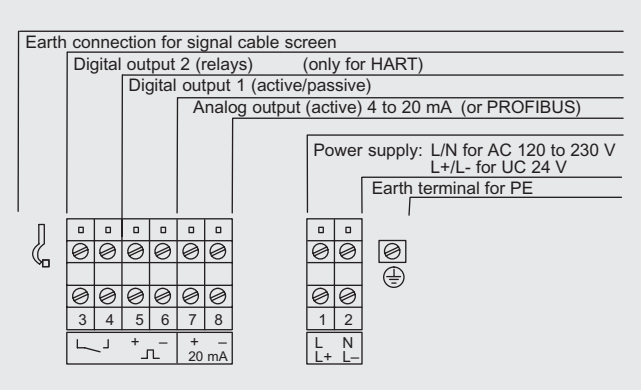
Explosion protection	
• ATEX version w. HART	II 2G EEx de IIC T6
• ATEX version w. PROFIBUS PA	II 2G EEx d [ia] IIC T6

Dimensional drawings



SITRANS FUS060, dimensions in mm (inch)

Schematics


Earth connection for signal cable screen
Digital output 2 (relays) (only for HART)
Digital output 1 (active/passive)
Analog output (active) 4 to 20 mA (or PROFIBUS)
Power supply: L/N for AC 120 to 230 V
L+/L- for UC 24 V
Earth terminal for PE
3 4 5 6 7 8
20 mA
1 2
L N
L+ L–

SITRANS FUS060

4

SONOFLO SONO 3300/3000 Industry

Overview

The combination of sensor SONO 3300 sensor and SONO 3000 transmitter is ideal for applications within the general industry. Measurements are independent of liquid temperature, density, pressure and conductivity. Transducers cannot be changed.

Benefits

- Compact / remote design
- Robust design for industrial applications
- Measures all liquids less than 350 cSt, conductive or non conductive
- No pressure drop
- Reliable and accurate flow measurements
- Long time stability

Application

The main application for SONO 3300 / 3000 ultrasonic flowmeter is measurement of volume.

SONO 3300 / 3000 can be used for water and treated waste water, oil and liquid gases, hot water / cooling systems.

Design

The SONO 3300 / 3000 consists of a casted sensor (DN 50 ... 150 (2" … 6")), welded pipes (DN 200 … 300 (8" … 12")) and the transmitter SONO 3000.

The transmitter can be compact or wall mounted.

The signal cables from transducers to transmitter are highly protected from aggressive environment by protection of stainless steel pipes.

Sensor installation

See system information

Technical specifications

2-track sensor with flanges and integrated transducers

Error in measurement	
Error in measurement at reference conditions; % of measured value	v>0.5...10m/s, <± 0.5% of rate (v=flow speed)
	SONO 3300 DN 50 and DN 65: For Reynolds numbers $1000 < R_e < 5000$: ± 1.5%
Max. flow velocity	10 m/s (32 ft/s)
Nominal size	DN 50, DN 65, DN 80, DN 100, DN 125, DN 150, DN 200 (2" … 8")
	DN 250, DN 300 (10" … 12")
Liquid temperature	Separate version: -10 … +160 °C (14 … 320 °F)
	Compact version: -10 … +120 °C (14 … 248 °F)
	Compact EEx d: -10 … 160 °C (14 … 320 °F)
Ambient temperature	Separate version: -40 … +160 °C (-40 … +320 °F)
	Compact version: -20 … +55 °C (-4 … +131 °F)
	Storage: -40 … +85 °C (-40 … 185 °F)
Enclosure	Standard version: IP67 (NEMA 4X/6)
Process connections	
PN designated EN 1092-1-type 11,B	• DN 50 ... DN 300 (2" … 12"), PN 40
	• DN 100 ... DN 300 (4" … 12"), PN 16
	• DN 200 ... DN 300 (8" … 12"), PN 10
Class designated EN 1759-1-type 11,B	• DN 125 ... DN 300 (5" ... 12"), class 150
	• DN 50 ... DN 300 (2" ... 12"), class 300
Transducer	Integrated version welded into pipe
Materials	
Pipe	• DN 50 ... DN 150 (2" … 6"): Steel EN 1.113145-16Mn5
	• DN 200 ... DN 300 (8" … 12"): Steel EN 1.0345-P235GH
Flange	• DN 50 ... DN 300 (2" … 12"): EN 1.0025-S235JRG2
Class	ASTM A105
Transducer	Stainless steel AISI 316 or similar
Certificates and approvals	
Ex approval sensor	• Ex version: Compact EEx de [ia/ib] IIC T5-T6, no ATEX
	• Ex version: Separate EEx de IIC T3-T6, no ATEX
Material certificate	The sensor is supplied as standard with a Siemens Flow Instruments certificate of conformity. Material certificate on wetted parts on request
NDT examination report	Available on request

The sensors are approved according to EU directive 97/23EF dated 29 May 1997 regarding fluid group 1, classified in category III. Design according to EN 13480 (PED Directive).

Coaxial cable between sensor and transmitter

Coaxial cable (75 Ω) for SONO 3300/3000	
1 x Ø 0.8 mm (0.03") copper conductor with shield	
Diameter	5.8 mm (0.23")
Length	Max. 250 m (820 ft) between sensor and transmitter
Material (outside jacket)	Black PE
Ambient temperature	-10 … +75 °C (+14 ... +167 °F)
1 x Ø 0.65 mm (0.026") copper conductor with shield	
Diameter	5.3 mm (0.21")
Length	Max. 100 m (328 ft) between sensor and transmitter
Material (outside jacket)	Brown FEP (Teflon)
Ambient temperature	-200 … +200 °C (-328 ... +392 °F)

4

SONOFLO SONO 3300/3000 Industry

Standard FDK number available

All 2-track, painted steel, flanges, AISI 316 transducers, wet calibrated.

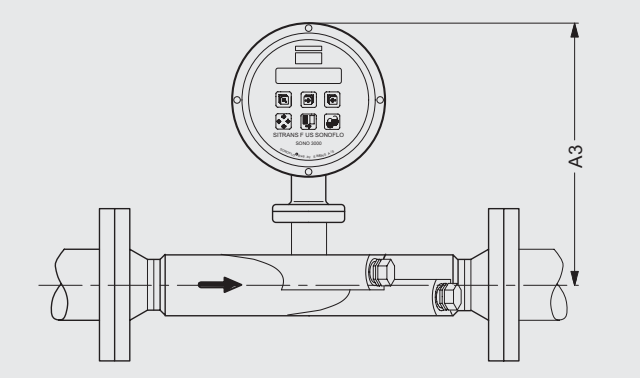
Sensor enclosure	Certificates	Pressure	Size								
			DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300
			FDK-	FDK-	FDK-	FDK-	FDK-	FDK-	FDK-	FDK-	FDK-
IP67 [1] standard	Certificate of conformity	PN 10							085L3020	085L3025	085L3030
		PN 16			085L3125	085L3012	085L3013	085L3014	085L3021	085L3026	085L3031
		PN 40	085L3000	085L3001	085L3002	085L3003	085L3004	085L3005	085L3022	085L3027	085L3032
		ANSI class 150	085L3121		085L3182	085L3131	085L3015	085L3016	085L3023	085L3028	085L3033
		ANSI class 300	085L3006	085L3007	085L3008	085L3009	085L3010	085L3011	085L3024	085L3029	085L3034
	Material certificate	PN 10									085L3174
		PN 16			085L3140	085L3116	085L3135	085L3136	085L3134		085L3171
		PN 40	085L3141	085L3128	085L3129	085L3145	085L3122	085L3146	085L3132	085L3144	
		ANSI class 150				085L3179		085L3161			
		ANSI class 300							085L3166		085L3165
	Material certificate + welding inspection	PN 16			085L3151	085L3152	085L3153	085L3154	085L3120		085L3155
		PN 40	085L3149	085L3150	085L3163	085L3130			085L3138		085L3158
		ANSI class 150				085L3123					
IP67 [2], EEx de IIC T3-T6, no ATEX	Certificate of conformity	PN 10							085L3100	085L3105	085L3110
		PN 16			085L3137	085L3092	085L3093	085L3094	085L3101	085L3106	085L3111
		PN 40	085L3080	085L3081	085L3082	085L3083	085L3084	085L3085	085L3102	085L3107	085L3112
		ANSI class 150	085L3156		085L3178	085L3139	085L3095	085L3096	085L3103	085L3108	085L3113
		ANSI class 300	085L3086	085L3087	085L3088	085L3089	085L3090	085L3091	085L3104	085L3109	085L3114
	Material certificate	PN 16				085L3126			085L3118		
		PN 40			085L3169			085L3160			085L3168
		ANSI class 150				085L3177					
		ANSI class 300				085L3147					
	Material certificate + welding inspection	ANSI class 300									085L3127
IP67 [3], EEx de [ia/ib] IIC T5-T6, no ATEX	Certificate of conformity	PN 10							085L3060	085L3065	085L3070
		PN 16			085L3164	085L3052	085L3053	085L3054	085L3061	085L3066	085L3071
		PN 40	085L3040	085L3041	085L3042	085L3043	085L3044	085L3045	085L3062	085L3067	085L3072
		ANSI class 150	085L3124	085L3119	085L3142	085L3143	085L3055	085L3056	085L3063	085L3068	085L3073
		ANSI class 300	085L3046	085L3047	085L3048	085L3049	085L3050	085L3051	085L3064	085L3069	085L3074
	Material certificate	PN 40				085L3115					
		ANSI class 150	085L3173		085L3172	085L3175		085L3159			085L3167
		ANSI class 300				085L3176		085L3180	085L3181		085L3157
	Material certificate + welding inspection	PN 40			085L3170						

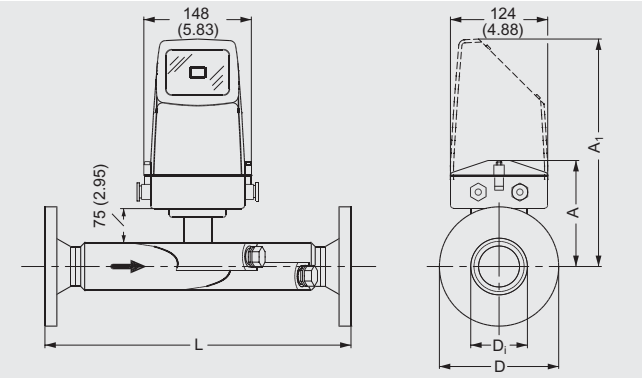
[1] Transmitter SONO 3000 IP67(NEMA 4X/ 6) can be mounted compact, other transmitter remote mounted. Transmitter, cables and IP67 (NEMA 4X/6) wall mounting kit have to be ordered separately

[2] Transmitter SONO 3000 remote mounted in safe area or SONO 3000 Ex d wall mounted Transmitter, cables and IP67 (NEMA 4X/6) wall mounting kit have to be ordered separately

[3] Transmitter SONO 3000 Ex d inclusive and compact mounted on the sensor

Dimensional drawings





SONO 3300/3000 industry

DN	DIN 2632 / DIN 2633 / DIN 2635																	
	PN 10						PN 16						PN 40					
	L		D		D_i		L		D		D_i		L		D		D_i	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
50													475	18.70	165	6.50	52.60	2.07
65													475	18.70	185	7.28	62.70	2.47
80							380	14.96	200	7.87	78.00	3.07	400	15.75	200	7.87	78.00	3.07
100							355	14.72	220	8.66	102.40	4.00	400	15.75	235	9.25	102.40	4.00
125							375	14.72	250	9.84	128.30	5.05	400	15.75	270	10.63	128.30	5.05
150							360	14.17	285	11.22	154.20	6.07	400	15.75	300	11.81	154.20	6.07
200	400	15.75	340	13.39	207.30	8.16	400	15.75	340	13.39	207.30	8.16	450	17.72	375	14.76	206.50	8.13
250	400	15.75	395	15.55	260.40	10.25	400	15.75	405	15.94	260.40	10.25	500	19.69	450	17.72	258.80	10.19
300	400	15.75	445	17.52	309.70	12.19	420	16.54	460	18.11	309.70	12.19	500	19.69	515	20.28	307.90	12.12

DN	ANSI												without SONO 3000		with SONO 3000				Weight [1]			
	150 lb						300 lb												DIN (PN 40)		ANSI CL 300	
	L		D		D_i		L		D		D_i		A		A1		A3					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs	kg	lbs
50	510	20.08	152	5.98	52.6	2.07	520	20.47	165	6.50	52.6	2.07	180	7.09	272	10.71	234	9.21	14	30.9	17	37.5
65	510	20.08	178	7.01	62.7	2.47	520	20.47	190	7.48	62.7	2.47	186	7.32	278	10.94	240	9.45	16	35.3	20	44
80	420	16.54	191	7.52	78.0	3.07	440	17.32	210	8.27	78.0	3.07	193	7.60	283	11.14	245	9.65	19	42	23	51
100	420	16.54	229	9.01	102.4	4.03	440	17.32	254	10	102.4	4.03	205	8.07	297	11.69	259	10.20	25	55	35	78
125	440	17.32	254	10.00	128.3	5.05	460	18.11	279	10.98	128.3	5.05	218	8.58	310	12.20	272	10.71	29	64	40	89
150	430	16.93	279	10.98	154.2	6.07	450	17.71	318	12.52	154.2	6.07	232	9.13	324	12.76	286	11.26	35	78	50	111
200	480	18.90	343	13.50	202.7	7.98	500	19.69	381	15	202.7	7.98	256	10.08	348	13.70	310	12.20	54	119	72	160
250	490	19.29	406	15.98	254.5	10.02	520	20.47	444	17.48	254.5	10.03	283	11.14	375	14.76	337	13.27	85	189	98	217
300	550	21.65	483	19.02	306.3	12.06	580	22.83	521	20.51	306.3	12.06	309	12.17	401	15.79	363	14.49	115	256	142	322

[1] When mounting the transmitter, the weight increases by 2 kg (4.4 lb), with the EEx transmitter, the weight increases by 10 kg (48.5 lb).

SONOFLO SONO 3100/FUS060 Industry

Overview

The SONO 3100 sensor and the FUS060 transmitter is an ideal combination for applications where process shut down is impossible during service and where there is a need for extreme high/low temperatures and pressures.

Transducers can easily be changed without interrupting operation. SONO 3100 can be delivered in 4-track solution for absolute best performance and accuracy.

Benefits

- Replaceable transducers under pressure
- Measure on all liquids less than 350 Cst, conductive or non conductive
- No pressure drop
- Reliable and accurate flow measurements
- Long time stability
- On request:
  - Special sensor material, e.g. Duplex
  - High/low temperature sensor version: +250 °C (+482 °F) / -200 °C (-382 °F) sensors
  - Pressure rating 430 bar (6235 psi)
  - 4 track sensor technology

Application

The main application for SONO 3100 in combination with FUS060 ultrasonic flowmeter is to measure volume within.

- Petrochemical industry
- Power engineering
- Water and waste water
- Oil and liquid gases

SITRANS FUS060 holds ATEX for hazardous areas, HART and PROFIBUS PA. SONO 3100 holds ATEX Ex approval.

Design

The SONO 3100 in combination with FUS060 consists of a SONO 3100 sensor, transducers with O-rings or flanges depending on selection - and a FUS060 transmitter.

SONO 3100 is basically supplied in a 2-track solution with and without flanges in sizes from DN 100 to DN 1200.

4 track version is avaible on request.

SONO 3100 is as standard available in carbon/stainless steel from DN 100 to DN 1200.

FUS060 is designed for wall mounting only.

Technical specifications

2-track sensor fitted with four SONO 3200 transducers

Error in measurement	
Error in measurement at reference conditions; % of measured value	v>0.5...10m/s, <± 0.5% of rate (v=flow speed)
Max flow velocity	10 m/s (32 ft)
Nominal size	DN 100 ... DN 1200 (4” ... 48”)
Liquid temperature	-10 °C ... +200 °C (14 ... 392 °F)
Ambient temperature	-20 °C ... +200 °C (-4 ... +392 °F)
Enclosure	IP68 (NEMA 6)
Process connections	
PN designated, EN 1092-1-type II, B	
Pipe material carbon steel	• DN 200 ... DN 1200 (8” ... 48”) PN 10 • DN 100 ... DN 1200 (4” ... 48”) PN 16 • DN 200 ... DN 1000 (8” ... 40”) PN 25 • DN 100 ... DN 500 (4” ... 20”) PN 40
Pipe material stainless steel	• DN 200 ... DN 300 (8” ... 12”) PN 10 and PN 25 • DN 100 ... DN 300 (4” ... 12”) PN 16 and PN 40
Class designated, EN 1759-1-type II, B	
Pipe material carbon steel	• DN 100 ... DN 600 (4” ... 24”) Class 150 • DN 100 ... DN 300 (4” ... 12”) Class 300
Pipe material stainless steel	• DN 100 ... DN 300 (4” ... 12”) Class 150 and Class 300
Without flanges, only in carbon steel	• DN 100 ... DN 1200 (4” ... 48”) PN 16 • DN 200 ... DN 1000 (8” ... 40”) PN 25 • DN 100 ... DN 500 (4” ... 20”) PN 40
Transducer SONO 3200	O-ring or flange versions

2-track sensor fitted with four SONO 3200 transducers

Materials	
Pipe	Steel EN 1.0345-P235GH or stainless steel EN 1.4404 - AISI 316L
Flange	
PN	EN 10025-S235JRG2, 1E1 or stainless steel EN 10222-5-1.4404, 13E0
Class	ASTM A105,1,1 or stainless steel ASTM F316L,2,3
Transducer body	Stainless steel AISI 316 or similar
Transducer terminal house	Stainless steel AISI 316 or plastic PA 6.6
Certificates and approvals	
Ex approval sensor	ATEX EEx i IIC T3
Material certificates	The sensor is supplied as standard with a Siemens Certificate of Conformity. Material certificate on wetted parts on request.
NDT examination report	Available on request

The sensors are approved according to EU directive 97/23/EF, dated 29 May 1997, regarding fluid group 1, classified in category III. Design EN 13480 (PED directive)

SONOFLO SONO 3100/FUS060 Industry

Selection and Ordering data		Order-No. 7ME3100-	Order code
SITRANS F US SONO 3100 sensor 2-track			
Diameter	**Qn [m³/h]**		
DN 100 / 4"	28	1N	
DN 100 / 4"	100	1P	
DN 100 / 4"	220	1R	
DN 125 / 5"	44	1S	
DN 125 / 5"	150	1T	
DN 125 / 5"	350	1V	
DN 150 / 6"	64	2A	
DN 150 / 6"	220	2B	
DN 150 / 6"	500	2D	
DN 200 / 8"	110	2E	
DN 200 / 8"	380	2F	
DN 200 / 8"	900	2H	
DN 250 / 10"	180	2J	
DN 250 / 10"	600	2K	
DN 250 / 10"	1300	2M	
DN 300 / 12"	250	2N	
DN 300 / 12"	850	2P	
DN 300 / 12"	2000	2R	
DN 350 / 14"	350	2S	
DN 350 / 14"	1000	2T	
DN 350 / 14"	2800	2V	
DN 400 / 16"	450	3A	
DN 400 / 16"	1300	3B	
DN 400 / 16"	3600	3D	
DN 500 / 20"	1300	3J	
DN 500 / 20"	2200	3K	
DN 500 / 20"	4200	3M	
DN 600 / 24"	1300	3S	
DN 600 / 24"	3200	3T	
DN 600 / 24"	4200	3V	
DN 700 / 28"	2000	4E	
DN 700 / 28"	4200	4F	
DN 800 / 32"	4200	4N	
DN 800 / 32"	5500	4P	
DN 900 / 36"	4200	5A	
DN 900 / 36"	7500	5B	
DN 1000 / 40"	4200	5J	
DN 1000 / 40"	9000	5K	
DN 1200 / 48"	4200	5S	
DN 1200 / 48"	13200	5T	
Flange norm and pressure rating (All sizes are not available in all pressure ratings)			
EN 1092-1			
PN 10		B	
PN 16		C	
PN 25		D	
PN 40		E	
ANSI B16.5			
class 150		H	
class 300		J	
pipe without flanges			
PN 10		P	
PN 16		Q	
PN 25		R	
PN 40		S	

Selection and Ordering data	Order-No. 7ME3100-	Order code
SITRANS F US SONO 3100 sensor 2-track		
Pipe and flange material		
Carbon steel	1	
Stainless steel	2	
Transducer type and approval		
IP67 (NEMA 4X/6) PA housing, PN 40, O-ring, 50 mm, 100 °C (212 °F)	1	
IP68 SS housing, PN 40, O-ring, 50 mm, 200 °C (392 °F)	2	
IP67 (NEMA 4X/6) PA housing, PN 40, flange, 88 mm, 100 °C (212 °F)	4	
IP68 SS housing, PN 40, flange, 88 mm, 200 °C (392 °F)	5	
IP68 SS housing, PN 40, O-ring, 50 mm, 190 °C (374 °F), EEx i IIC T3, M20 gland, ATEX approval	7	
IP68 SS housing, PN 40, flange, 88 mm, 190 °C (374 °F), EEx i IIC T3, M20 gland, ATEX approval	8	
Cable gland entires		
Cable glands M20 in transducers and in transmitter M25/20/16 x 1.5	1	
Cable glands ½" NPT in transducers and in transmitter	2	
Transmitter SITRANS FUS060		
IP65 (NEMA 4), 120/230 V AC	N	
IP65 (NEMA 4), 24 V AC/DC	P	
IP65 (NEMA 4), 24 V AC/DC ATEX Ex-d	Q	
Module		
HART, 1 pulse output, 1 relay	B	
HART EEx e, 1 pulse output, 1 relay	C	
PROFIBUS PA,1 pulse/frequency	D	
PROFIBUS PA, EEx [ia], 1 pulse/frequency	E	
Transducer coax cable		
4 x 3 meter, max. 70 °C (158 °F)		0
4 x 15 meter, max. 70 °C (158 °F)		1
Teflon cable 4 x 3 meter, max. 200 °C (392 °F)		7
Teflon cable 4 x 15 meter, max. 200 °C (392 °F)		8

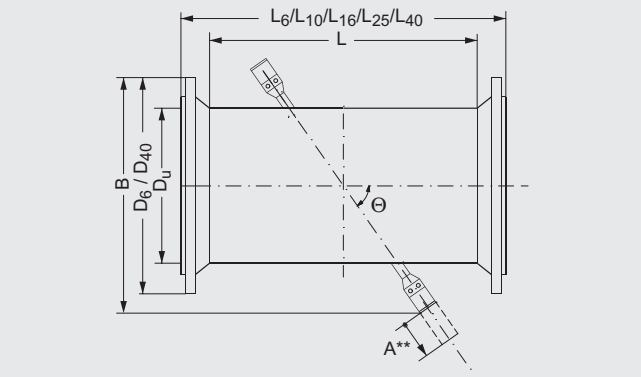
Please also see www.siemens.com/SITRANSFordering for practical examples of ordering

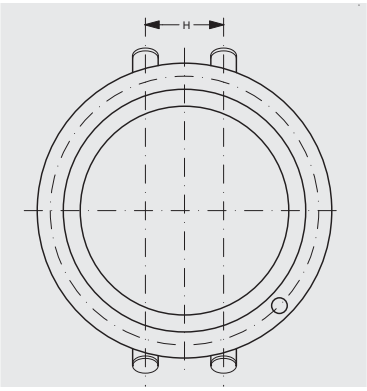
SONOFLO SONO 3100/FUS060 Industry

Selection and Ordering data	Order code
Additional information	
Please add „-Z“ to Order No. and specify Order code(s) and plain text.	
Calibration	
Production calibration DN 100 ... DN 1200	**Included**
Theoritical calibration DN 500 ... DN 1200	**D03**
Match pair calibration 2 x 3 points Max. flow 250 ... 1300 m^3/h depending on dimension (DN 100 ... DN 500)	**D06**
Match pair calibration 2 x 3 points Max. flow 1400 ... 4200 m^3/h depending on dimension (DN 300 ... DN 700)	**D07**
Match pair calibration 2 x 3 points Max. flow 4200 m^3/h depending on dimension (DN 800 ... DN 1200)	**D08**
Accredited Siemens ISO/IEC 17025 calibration Max. flow 250 ... 1300 m^3/h depending on dimension (DN 100 ... DN 500)	**D21**
Accredited Siemens ISO/IEC 17025 calibration Max. flow 1400 ... 4200 m^3/h depending on dimension (DN 300 ... DN 700)	**D22**
Accredited Siemens ISO/IEC 17025 calibration Max. flow 4200 m^3/h depending on dimension (DN 800 ... DN 1200)	**D23**
Accredited - Third party ISO/IEC 17025 calibration Max. flow 250...1300 m^3/h depending on dimension (DN 100 ... DN 500)	**D31**
Accredited - Third party ISO/IEC 17025 calibration Max. flow 1400...4200 m^3/h depending on dimension (DN 300 ... DN 700)	**D32**
Accredited - Third party ISO/IEC 17025 calibration Max. flow 4300...7000 m^3/h depending on dimension (DN 800 ... DN 1200)	**D33**
EN 10204-3.1.B	**F10**
EN 10204-3.1.B and 100% NDT on weldings, DN 100 ... DN 400	**F11**
EN 10204-3.1.B and 100% NDT on weldings, DN 500 ... DN 700	**F12**
EN 10204-3.1.B and 100% NDT on weldings, DN 800 ... DN 1200	**F13**
Pressure certificate	
EN 10204-2.3	**F21**
Tag name plate	
Stainless steel tag with 12 mm characters, max. 15 characters (add plain text)	**Y17**
Self-adhesive plastic tag with 8 mm characters, max. 15 characters (add plain text)	**Y18**

Please also see www.siemens.com/SITRANSFordering
for practical examples of ordering

Dimensional drawings





EN 1092-1

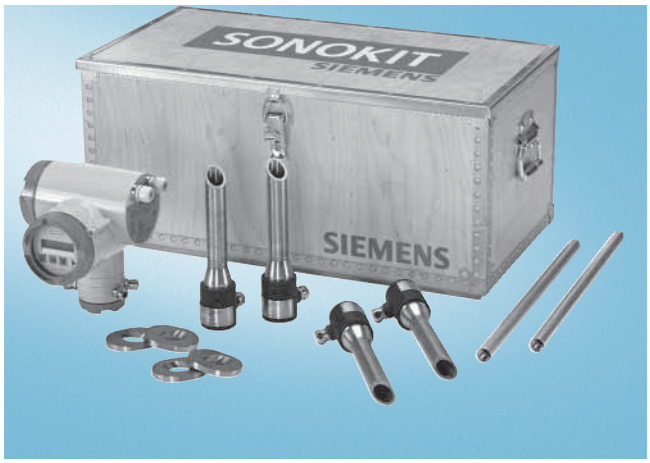
						PN10			PN16			PN25			PN40		
DN	**D_U**	**L**	**B**	**q**	**H**	**W_{10} [1]**	**D_{10} Flange dia.**	**L_{10}**	**W_{16} [1]**	**D_{16} Flange dia.**	**L_{16}**	**W_{25} [1]**	**D_{25} Flange dia.**	**L_{25}**	**W_{40} [1]**	**D_{40} Flange dia.**	**L_{40}**
	[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
100	114.3	860	305	30	48.2	3.6	220	960	3.6	220	960	3.6	235	990	3.6	235	990
125	139.7	862	325	30	59.3	4.0	250	970	4.0	250	970	4.0	270	990	4.0	270	990
150	168.3	862	350	30	71.7	4.5	285	970	4.5	285	970	4.5	300	1010	4.5	300	1010
200	219.1	668	430	45	92.9	6.3	340	790	6.3	340	790	6.3	360	820	6.3	375	840
250	273.0	714	480	45	117.2	6.3	395	850	6.3	405	850	7.1	425	890	7.1	450	920
300	323.9	607	525	45	139.4	7.1	445	740	7.1	460	760	8.0	485	790	8.0	515	830
350	355.6	639	550	45	152.8	8.0	405	770	8.0	520	800	8.0	555	840	8.8	580	880
400	406.4	703	600	45	175.7	8.0	565	850	8.0	580	875	8.8	620	925	11.1	660	975
500	508.0	797	690	45	222.2	7.1	670	950	8.0	715	980	10.0	730	1050	14.2	755	1080
600	610.0	912	705	60	268.1	7.1	780	1075	8.8	840	1105	11.0	845	1165	-	-	-
700	711.0	937	895	60	312.8	8.0	895	1100	8.8	910	1140	12.5	960	1190	-	-	-
800	813.0	967	985	60	358.7	8.0	1015	1150	10.0	1025	1180	14.2	1085	1240	-	-	-
900	914.0	1007	1070	60	402.3	10.0	1115	1200	10.0	1125	1230	16.0	1185	1300	-	-	-
1000	1016.0	1060	1160	60	448.2	10.0	1230	1250	10.0	1255	1300	17.5	1320	1370	-	-	-
1200	1220.0	1100	1350	60	539.1	11.0	1455	1330	12.5	1485	1360	-	-	-	-	-	-

[1] Wall thickness

SONO 3100, 2-track				
Nominal diam.	Weight [kg] ([lbs])			
DN	PN 10	PN 16	PN 25	PN 40
100	32 (70.5)	32 (70.5)	35 (77.2)	35 (77.2)
125	38 (83.8)	38 (83.8)	44 (97.0)	44 (97.0)
150	45 (99.2)	45 (99.2)	52 (114.6)	52 (114.6)
200	59 (130.0)	58 (127.9)	70 (154.3)	79 (174.2)
250	73 (161.0)	75 (163.3)	96 (211.6)	117 (257.9)
300	83 (183.0)	92 (202.8)	114 (251.3)	151 (332.9)
350	98 (216.0)	113 (249.1)	145 (332.9)	191 (421.1)
400	119 (262.4)	141 (310.9)	191 (421.1)	275 (606.3)
500	153 (337.3)	207 (456.4)	284 (626.0)	379 (836.0)
600	193 (425.5)	276 (608.5)	363 (800.3)	-
700	262 (577.6)	303 (668.0)	480 (1058)	-
800	329 (725.3)	400 (881.8)	650 (1433)	-
900	428 (943.6)	475 (1047)	835 (1841)	-
1000	500 (1002)	594 (1010)	1078 (2377)	-
1200	732 (1614)	902 (1989)	-	-

SONOFLO SONOKIT

Overview



SONOKIT is a transit time based ultrasonic flowmeter for retrofitting on existing pipelines.

The kit includes all necessary parts and special tools to make the installation as 1- or 2-track flowmeter.

The set is made for installation on empty pipes or pipes under pressure without process shut-down (hot-tap).

Please contact Siemens for further information on hot-tap tools and instructions.

SONOKIT has wetted transducers (in contact with media) which assure superior accuracy and performance.

Benefits

- Cost-effective solution – contains all the necessary components for retrofitting
- SONOKIT is easy to install in pipeline sizes DN 200 to DN 4000 (8" to 160") 1-track DN 100 to DN 2400 (4" to 96") – without process shut-down or flow interruption
- No bypass installation necessary – withstands pressures up to 40 bar (580 psi) and media temperatures between -20 °C and +200 °C (-4 °F and +392 °F)
- High accuracy – the bigger the pipe, the more accurate the result
- Solid construction and no moving parts for a 100% maintenance and obstruction free flowmeter
- The SONOKIT comes with transducers in IP68 enclosure
- Available in a robust version that can be buried and withstands constant flooding
- Wetted transducers assure superior accuracy and performance
- Automatic calculation of the calibration factor when pipe geometry data are entered in the transmitter
- Transmitter versions with HART or PROFIBUS PA

Application

- Raw water intake for water treatment plants
- Water distribution systems
- Irrigation systems
- Water power stations
- District heating plants
- Cooling water plants within the industry and in power stations
- Systems within the oil and refinery business
- Sewage treatment plants
- Plants transporting non-conductive liquids

Design

The SONOKIT set contains all necessary parts to build a ultrasonic flowmeter on existing pipes depending on choices at ordering:

- Papers to wrap around pipes for alignment of sensors
- Transducer alignment tools
- Mounting plates and SITRANS FUS060 transmitter type according to ordering
- Cables
- 4 track version is available on request
- Wall mounting

Technical specifications

Accuracy

Typical, depending on accuracy of measurements of installation	≤ ± (0.5…1.5%)

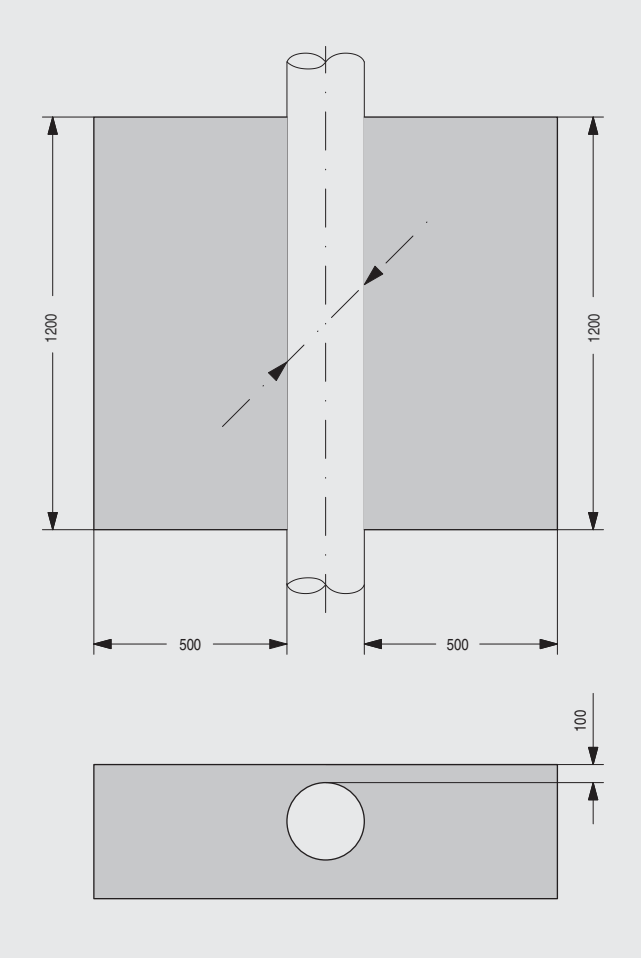
Note:
Accuracy depends on the accuracy of the measurements taken at location. This means that inaccurate measurements of angles, distance between transducers, wall thickness and pipe diameter have a direct effect on the accuracy. Values measured are entered into the memory of the FUS060 transmitter.

Requirements for pipes

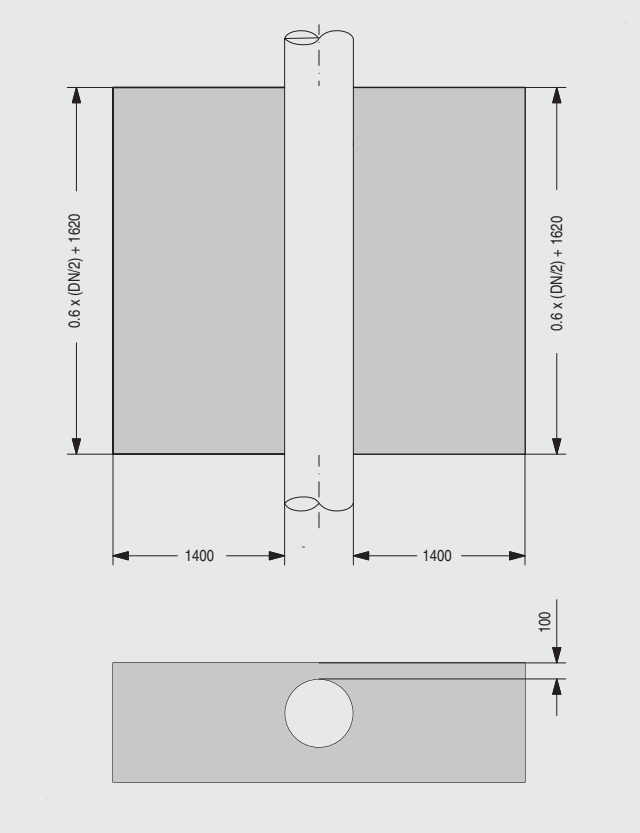
Requirements for pipes	
Size	DN 100 … DN 4000 (4" … 160")
Line pressure	max 40 bar (580 psi)
Liquid temperature	Standard version: -20 … +200 °C (-4 … +392 °F)
Enclosure	
Standard version	IP68
Ex approval sensor	ATEX EEx i IIC T3
Materials	
Terminal box	Standard version: PA 6.6, 100 °C (212 °F) AISI 316, 200 °C (392 °F)
Transducer element	Standard version: AISI 316, 200 °C (392 °F)
Materials of existing pipeline	
Steel	Transducer holder: EN 10273 or EN 10216 (P235GH)
	Mounting plates: EN 10273 or EN 10216 (P235GH)
Concrete	Transducer holder: AISI 316 or similar
	Mounting plates: (not included)
Stainless steel	Transducer holder: AISI 316 or similar
	Mounting plates: AISI 316 or similar
Pipe wall thickness	
Steel pipe (AISI 316 and St. 37.2 or corresponding material)	Transducer and holder available in length L = 160, allowing a pipe wall thickness up to 20 mm (0.79")
Concrete pipe	Transducer and holder available in length L = 230, allowing a pipe wall thickness up to 200 mm (7.9")
Dimension on the box (L x B x H)	820 x 410 x 360 mm (32.3" x 16.1" x 14.2")

Installation requirements

The space requirements around the pipe for retrofitting a SONOFLO ultrasonic flowmeter type SONOKIT are given below:



Empty pipe installation



Hot-tap installation

SONOFLO SONOKIT

Selection and Ordering data		Order-No.
SITRANS F US SONOKIT 1-track sensor		7ME3210-
Diameter	**Qn [m³/h]**	
DN 100 / 4"	100	1P
DN 125 / 5"	150	1T
DN 150 / 6"	220	2B
DN 200 / 8"	380	2F
DN 250 / 10"	600	2K
DN 300 / 12"	850	2P
DN 350 / 14"	1000	2T
DN 400 / 16"	1300	3B
DN 450 / 18"	1700	3F
DN 500 / 20"	2200	3K
DN 550 / 22"	2600	3P
DN 600 / 24"	3200	3T
DN 650 / 26"	3600	4B
DN 700 / 28"	4200	4F
DN 750 / 30"	4800	4K
DN 800 / 32"	5500	4P
DN 900 / 36"	7500	5B
DN 1000 / 40"	9000	5K
DN 1100 / 44"	10000	5P
DN 1200 / 48"	13200	5T
DN 1300 / 52"	14000	6A
DN 1400 / 56"	16800	6C
DN 1500 / 60"	19000	6E
DN 1600 / 64"	22800	6G
DN 1700 / 68"	25000	6J
DN 1800 / 72"	27600	6L
DN 1900 / 76"	31000	6N
DN 2000 / 80"	36000	6Q
DN 2100 / 84"	37000	6S
DN 2200 / 88"	42000	6U
DN 2300 / 92"	45000	6W
DN 2400 / 96"	51000	7A
Installation method		
Empty pipe		A
Hot tap, mounting under pressure		B
Tapping band (to be ordered separately)		C
Transducer holder		
None (for tapping band)		0
Carbon steel, length = 160 mm, mounting plates in carbon steel		1
Stainless steel, length = 160 mm, mounting plates in stainless steel		2
Stainless steel, length = 230 mm, for concrete pipe		3
Transducer type and approval		
IP67 (NEMA 4X/6) PA housing, PN 40, SS, O-ring, 100 °C (212 °F), no approval		1
IP68 PA housing, Sylgard potting kit, PN 40, SS, O-ring, 100 °C (212 °F), no approval		3
IP68 SS housing, Sylgard potting kit, PN 40, SS, O-ring, 200 °C (392 °F), no approval		4
IP68 SS housing, PN 40, SS, O-ring, 190 °C (374 °F), EEx i IIC T3, M20 gland, ATEX approval		5
Cable gland entires		
Cable glands M20 in transducers and in transmitter M25/20/16 x 1.5		1
Cable glands ½" NPT in transducers and in transmitter		2

Selection and Ordering data	Order-No.
SITRANS F US SONOKIT 1-track sensor	7ME3210-
Transmitter SITRANS FUS060	
IP65 (NEMA 4), 120/230 V AC	N
IP65 (NEMA 4), 24 V AC/DC	P
IP65 (NEMA 4), 24 V AC/DC ATEX Ex-d	Q
Module (FUS060 only)	
HART, 1 pulse output, 1 relay	B
HART EEx e, 1 pulse output, 1 relay	C
PROFIBUS PA, 1 pulse/frequency	D
PROFIBUS PA, EEx [ia], 1 pulse/frequency	E
Transducer coax cable	
2 x 3 meter, 70 °C (158 °F)	0
2 x 15 meter, 70 °C (158 °F)	1
2 x 3 meter, high temperature 200 °C (392 °F)	7
2 x 15 meter, high temperature 200 °C (392 °F)	8

Selection and Ordering data	Order code
Additional information	
Please add „-Z" to Order No. and specify Order code(s) and plain text.	
Material certificate	
EN 10204-3.1.B, transducer body material	**F30**
EN 10204-3.1.B, transducer holder material	**F31**
EN 10204-3.1.B, mounting plate material	**F32**
Tag name plate	
Stainless steel tag with 12 mm characters (max. 15 characters) (add plain text)	**Y17**
Self-adhesive plastic tag with 8 mm characters (max. 15 characters) (add plain text)	**Y18**

Please also see www.siemens.com/SITRANSFordering for practical examples of ordering

Selection and Ordering data		Order-No.
SITRANS F US SONOKIT 2-track sensor		7ME3220-
Diameter	**Qn [m^3/h]**	
DN 200 / 8"	380	2F
DN 250 / 10"	600	2K
DN 300 / 12"	850	2P
DN 350 / 14"	1000	2T
DN 400 / 16"	1300	3B
DN 450 / 18"	1700	3F
DN 500 / 20"	2200	3K
DN 550 / 22"	2600	3P
DN 600 / 24"	3200	3T
DN 650 / 26"	3600	4B
DN 700 / 28"	4200	4F
DN 750 / 30"	4800	4K
DN 800 / 32"	5500	4P
DN 900 / 36"	7500	5B
DN 1000 / 40"	9000	5K
DN 1100 / 44"	10000	5P
DN 1200 / 48"	13200	5T
DN 1300 / 52"	14000	6A
DN 1400 / 56"	16800	6C
DN 1500 / 60"	19000	6E
DN 1600 / 64"	22800	6G
DN 1700 / 68"	25000	6J
DN 1800 / 72"	27600	6L
DN 1900 / 76"	31000	6N
DN 2000 / 80"	36000	6Q
DN 2100 / 84"	37000	6S
DN 2200 / 88"	42000	6U
DN 2300 / 92"	45000	6W
DN 2400 / 96"	51000	7A
DN 2500 / 100"	53000	7C
DN 2600 / 104"	60000	7E
DN 2700 / 108"	62000	7G
DN 2800 / 112"	72000	7J
DN 2900 / 116"	71000	7L
DN 3000 / 120"	78000	7N
DN 3100 / 124"	82000	7Q
DN 3200 / 128"	85000	7S
DN 3300 / 132"	92000	7U
DN 3400 / 136"	100000	7W
DN 3500 / 140"	100000	8A
DN 3600 / 144"	110000	8C
DN 3700 / 148"	120000	8E
DN 3800 / 152"	130000	8G
DN 3900 / 156"	130000	8J
DN 4000 / 160"	144000	8L
Installation method		
Empty pipe		A
Hot tap, mounting under pressure		B
Tapping band (to be ordered separately)		C
Transducer holder		
None (for tapping band)		0
Carbon steel, length = 160 mm, mounting plates in carbon steel		1
Stainless steel, length = 160 mm, mounting plates in stainless steel		2
Stainless steel, length = 230 mm, for concrete pipe		3

Selection and Ordering data	Order-No.
SITRANS F US SONOKIT 2-track sensor	7ME3220-
Transducer type and approval	
IP67 (NEMA 4X/6) PA housing, PN 40, SS, O-ring, 100 °C (212 °F), no approval	1
IP68 PA housing, Sylgard potting kit, PN 40, SS, O-ring, 100 °C (212 °F), no approval	3
IP68 SS housing, Sylgard potting kit, PN 40, SS, O-ring, 200 °C (392 °F), no approval	4
IP68 SS housing, PN 40, SS, O-ring, 190 °C (374 °F), EEx i IIC T3, M20 gland, ATEX approval	5
Cable gland entires	
Cable glands M20 in transducers and in transmitter M25/20/16 x 1.5	1
Cable glands ½" NPT in transducers and in transmitter	2
Transmitter SITRANS FUS060	
IP65 (NEMA 4), 120/230 V AC	N
IP65 (NEMA 4), 24 V AC/DC	P
IP65 (NEMA 4), 24 V AC/DC ATEX Ex-d	Q
Module (FUS060 only)	
HART, 1 pulse output, 1 relay	B
HART EEx e, 1 pulse output, 1 relay	C
PROFIBUS PA, 1 pulse/frequency	D
PROFIBUS PA, EEx [ia], 1 pulse/frequency	E
Transducer coax cable	
4 x 3 meter, 70 °C (158 °F)	0
4 x 15 meter, 70 °C (158 °F)	1
4 x 3 meter, high temperature 200 °C (392 °F)	7
4 x 15 meter, high temperature 200 °C (392 °F)	8

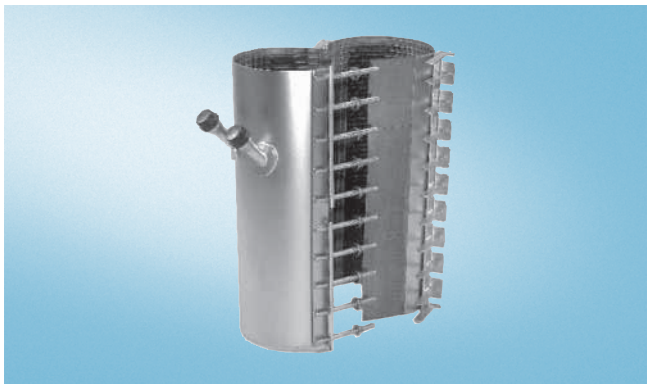
Selection and Ordering data	Order code
Additional information	
Please add „-Z" to Order No. and specify Order code(s) and plain text.	
Material certificate	
EN 10204-3.1.B, transducer body material	**F30**
EN 10204-3.1.B, transducer holder material	**F31**
EN 10204-3.1.B, mounting plate material	**F32**
Tag name plate	
Stainless steel tag with 12 mm characters (max. 15 characters) (add plain text)	**Y17**
Self-adhesive plastic tag with 8 mm characters (max. 15 characters) (add plain text)	**Y18**

Please also see www.siemens.com/SITRANSFordering for practical examples of ordering

SONOFLO SONOKIT

Accessories

Tapping band



SONOKIT tapping band is made specially for SONOKIT 1- or 2-track in order to be mounted outside on existing pipelines.

SONOKIT tapping bands are particularly designed to be mounted on non-weldable pipes, casted pipes, plastic pipes or concrete pipes.

Retrofitting of tapping band can be done on pressure raised and empty pipes

Design

SONOKIT tapping bands are made of stainless steel AISI 316.

A complete tapping band for SONOKIT contains, depending on size, 2–8 segments, sealing material, bolts and pre-mounted transducer holders

Ordering

Tapping band for SONOKIT is ordered according to numbers of tracks, outer diameter of pipe and wall thickness. SONOKIT tapping band is not available ex stock.

For further information regarding installation methods and special installation without pressure shut-down (Hot-tapping) please see product manuals for SONOKIT or call the Siemens sales office.

Ordering:
For ordering tapping bands - please contact Siemens Flow Instruments marketing department.

SITRANS FUS380/FUE380/SONOCAL 3000

Overview SITRANS FUS380

The 2-track flowmeter SITRANS FUS380 comes as battery or mains powered and is designed to measure water flow in district heating plants, local networks, boiler stations, substations, chiller plants and other general water applications.

The flowmeter is approved according to heat meter standards EN 1434 class 2 and OIML R75 class 2 and metrological parameters are protected against manipulation. The type approved flowmeter is named SITRANS FUE380.

Technically the meter types SITRANS FUS380 and SITRANS FUE380 are completely identical, only difference is the calibration limit.

Benefits

- Battery powered up to 6 years
- Battery back-up option in case of mains power failure
- Fast measuring frequency 20 Hz/0.5 Hz (230 V AC/Battery)
- Easy one button straight forward display
- 2-track measuring principle for optimum accuracy
- Compact or remote mounting
- Measures on all district water qualities and water conductivities
- No pressure drop
- Long-term stability
- Galvanic isolated digital output for easy connection to a calculator (potential free)
- Dynamic range Q_{min}:Q_{max} up to 1:400
- MODBUS RTU/RS 232, RS 485

Application

The main application for SITRANS FUS380 is measurement of water flow or water flow in heat meter systems in district heating networks or chilled water.

Combined with an energy calculator and a pair of temperature sensors, SITRANS FUE380 can be used as part of an energy meter system. For this purpose Siemens offers energy calculator SITRANS FUE950.

Design

The 2-track design of SITRANS FUS380 ensures maximum accuracy under short inlet conditions. The flowmeter consists of a flow sensor pipe, 4 transducers/transducer cables and a transmitter SITRANS FUS080.

The unit is available in a compact or a remote version with up to 30 meter distance from flowmeter to transmitter. When ordering a compact version the transducer cables are pre-mounted and ready for installation.

Compact mounting is only possible up to 120 °C (248 °F). The sensor must be isolated to protect transmitter from heat. The transmitter is available in an IP67/NEMA 4X/6 enclosure.

Integration

The flowmeter digital output is often used as input for an energy meter or as input for digital systems for remote reading.

SITRANS FUS380 has two digital output functions that can be individually selected, and optional MODBUS RTU communication modules.

Pulse output rate is defined when ordering.

If the flowmeter forms part of an energy meter system for custody transfer, no further approvals are needed, except eventually local approvals on the flowmeter.

Overview SONOCAL 3000

SONOCAL 3000 ultrasonic flowmeters are designed with blind display and 115 to 230 V power supply only and approved for custody transfer according to PTB, class C, OIML R75, class 4 and a number of local country approvals.

Benefits

- No pressure drop
- Reliable and accurate flow measurements
- Long-term stability with excellent performance
- Can measure on all district water independent of water quality and conductivity
- Low cost of ownership
- Matched pair calibration of complete system
- Local country approvals
- Outputs: one analog, pulse and relay

Design

The SONOCAL 3000 ultrasonic flowmeters consist of a sensor type SONO 3300 CT, transmitter SONO 3000 CT without display incl. remote mounting device and 4 pcs 10 m coaxial cables for connecting the sensor and the transmitter.
The sensor is a 2-track direct shot sensor type with flanges and integrated transducers.

The transmitter is only available in the shown IP67 (NEMA 4X/6) version.

All systems are sealed for custody transfer.

SITRANS FUS380/FUE380/SONOCAL 3000

Configuration SITRANS FUS380

Selection guide SITRANS FUS380, standard version

Flowmeter size nominal to EN 1092-1			DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 500	DN 600	DN 700	DN 800
Flow range [1]	Q_{max} (q_s)	m^3/h	240	400	560	900	1400	2100	2800	3600	5500	8000	10800	14200
	Q_{min} (q_i)	m^3/h	0.6	1.0	1.5	2.5	4.0	5.6	7.0	9.5	14.75	21.50	29.0	38.0
Dyn. range	q_i:q_s		1:400	1:400	1:373	1:360	1:350	1:375	1:400	1:379	1:373	1:372	1:372	1:373

Selection guide SITRANS FUE380, type approved version

According to EN 1434, class 2, flowmeter values

Flowmeter size nominal to EN 1092-1			DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 500	DN 600	DN 700	DN 800
Flow range [1]	Q_{max} (q_s)	m^3/h	120 or 180	200 or 280	300 or 420	500 or 700	800 or 1120	1120 or 1560	1500 or 2100	1900 or 2660	2950 or 4130	4300 or 6020	5800 or 8120	7600 or 10640
	Q_{nom} (q_p)	m^3/h	60	100	150	250	400	560	750	950	1475	2150	2900	3800
	Q_{min} (q_i)	m^3/h	0.6	1.0	1.5	2.5	4.0	5.6	7.5	9.5	14.75	21.5	29.0	38.0
Pulse value [2]		l/pulse	2.5	2.5	10	10	10	50	50	50	100	100	100	100

According to OIML R75, class 2, flowmeter values

Flowmeter size nominal to EN 1092-1			DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 500	DN 600	DN 700	DN 800
Flow range [1]	Q_{max} (qs)	m^3/h	180	280	420	700	1120	1560	2100	2660	4160	6020	8120	10640
	Q_{nom} (q_p)	m^3/h	120	200	300	500	800	1120	1500	1900	2950	4300	5800	7600
	Q_{min} (q_i)	m^3/h	1.2	2.0	3.0	5.0	8.0	11.2	15.0	19.5	29.5	43.0	58.0	76.0
Pulse value [2]		l/pulse	2.5	2.5	10	10	10	50	50	50	100	100	100	100

Dynamic range q_i:q_p: better than 1:100 according to EN 1434 and OIML R75 class 2

Low flow cut off: 0.2% of q_p (nominal)

In order to obtain best pulse output resolution in the range Q_{min} - Q_{max} of approx. 100 Hz at q_s, two or three values for every dimension can be selected at ordering.

[1] Other flow ranges - see MLFB ordering table

[2] In connection with SITRANS FUE950 - other pulse values - see MFLB ordering table

Technical specifications SITRANS FUS380

Pipe design	2-track sensor with flanges and integrated transducers wet calibrated from factory
Nominal size welded version	DN 100, 125, 150, 200, 250, 300, 350, 400, 500, 600, 700, 800
Pressure rate	PN 16, PN 25, PN 40 EN 1092-1
Pipe material	Carbon Steel EN 1.0345 / p235 GH
Transducer design	Integrated version welded onto the pipe
Transducer material	Stainless steel AISI 316
Sensor operating conditions	
Storage	-40 … +85 °C (-40 … +185 °F)
Liquid temperature	• Remote: 2 … 200 °C (35.6 … 392 °F) • Compact: 2 … 120 °C (35.6 … 248 °F)
Degree of protection	Sensor connection IP67/NEMA 4X/6
Max. flow velocity	DN 100 … 800: • FUS380: 8 m/s (26.2 ft/s) • FUE380: 6 m/s (19.7 ft/s)

Transmitter

Display	LCD, 8 digits, additional 2 digits and symbols for status information
Push button	One push button for display information
Communication	IrDA – optical communication interface with MODBUS RTU protocol Add-on modules: • RS 232 serial interface with MODBUS RTU (Rx/Tx/GND), point to point with max. 15 m cable • RS 485 serial interface with MODBUS RTU (+/-/GND), multidrop with up to 32 devices with max. 1000 m cable MODBUS RTU protocol is an open protocol (further information available on request) Serial speed 1200, 2400, 4800, 9600, 19200, 38400 Baud

Enclosure	IP67/NEMA 4X/6 to EN 60529 and DIN 40050
Temperature ambient	0 … 60 °C (32 … 140 °F)
Temperature storage	-40 … +85 °C (-40 … +185 °F) (battery included)
Installation	Compact on sensor: max. 120 °C (248 °F), Separate: max. 30 m (98.4 ft) from transmitter
Mechanical vibration	2 g, 1 … 800 Hz sinusoidal in all directions to IEC 68-2-6
Design	Fibre-glass reinforced polyamide
Power supply	• Battery: replaceable 3.6 V LiSOCl (Lithium Thionyl Chloride) battery pack 32 Ah • Mains: 87 … 265 V AC (50 … 60 Hz)
Measuring rate	Battery mode: 0.5 Hz Mains supply: 20 Hz Back-up mode: 0.5 Hz (at mains supply drop)
Digital output	Two passive individual galvanically isolated MOS relay outputs, A and B, max. ±35 V AC/DC, 50 mA
Max pulse frequency	100 Hz
Alarm indication	Track 1 (F1), track 2 (F2), Low battery indication (F5), qs overflow (F6), pulse overflow (F7)
Cable length	Max. 30 m (98.4 ft) between transmitter and sensor
EMC	• Emission EN 61000-6-4 • Immunity EN 61000-6-2
Approvals	EN 1434 and OIML R75 Class 2 (EN version from 1. july 2002)

Type dependent settings

	FUS380	**FUE380**
Flow value	Predefined settings according to dimension	Predefined according to EN 1434 / OIML R75
Approval	No approval	Country specific
Flow rate v_f	0.02 … 8 m/s (0.065 … 26.2 ft/s)	0.02 … 6 m/s (0.065 … 19.7 ft/s)
Output A	Forward / reverse	Preset: Forward
Output B	Preset: Alarm	Preset: Alarm
Output B, function	Reverse pulse, alarm, call-up	Preset: Alarm
Pulse value A & B (depending on DN value)	0.5 l/p 1 l/p 2.5 l/p 10 l/p 50 l/p 100 l/p 250 l/p 500 l/p 1 m^3/p 2.5 m^3/p 5 m^3/p 10 m^3/p 25 m^3/p 50 m^3/p 100 m^3/p 250 m^3/p 500 m^3/p 1000 m^3/p	Preset: See scheme - previous page Preset for SITRANS FUE950 or free selectable
Pulse width	5/10/20/50/100/200/500 ms	Preset: 5 ms
Flow unit setup	Preset: m^3/h	Preset: m^3/h
Volume unit setup	Preset: m^3	Preset: m^3

SITRANS FUE380 uncertainty

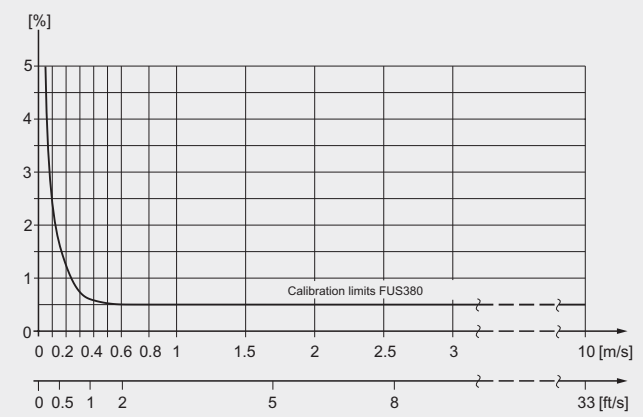
To ensure continuous accurate measurement, flowmeters must be calibrated. The calibration is conducted at SIEMENS flow facilities accredited according to ISO/IEC 17025 by DANAK or UKAS.

The accreditation bodies DANAK and UKAS have signed the ILAC MRA agreement (International Laboratory Accreditation Corporation - Mutual Recognition Arrangement). Therefore the accreditation ensures international traceability and recognition of the test results in 39 countries world wide, including the US (NIST traceability).

A calibration certificate is shipped with every SITRANS FUS380/FUE380.

Accuracy SITRANS FUS380:

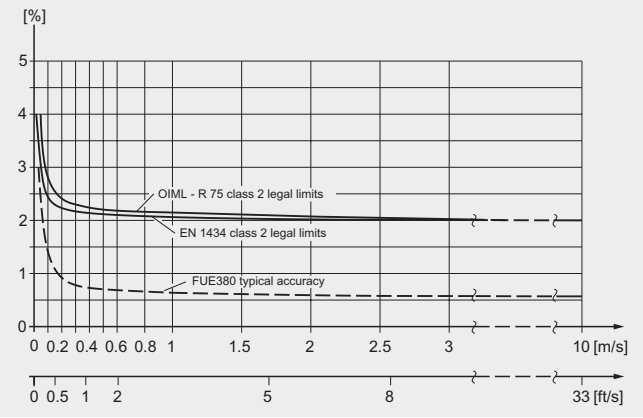
Standard calibration: Better than 0.5% of rate, 0.5 m/s < v < 8 m/s
v < 0.5 m/s, 0.5 + 0.25/v [%]



Typical accuracy SITRANS FUE380:

0.5 + 0.02 q_p/q [%]
q_p according to EN 1434/OIML requirements.

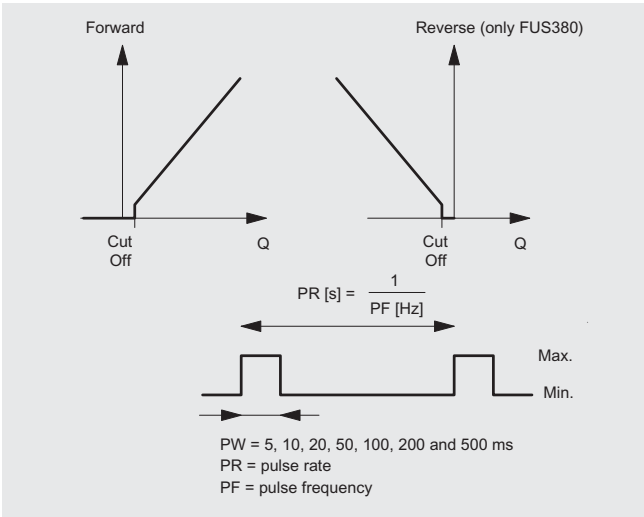
Example: DN 100, q_p = 60 m^3/h at q = 1.2 m^3/h:
Accuracy = typical 1.5 %



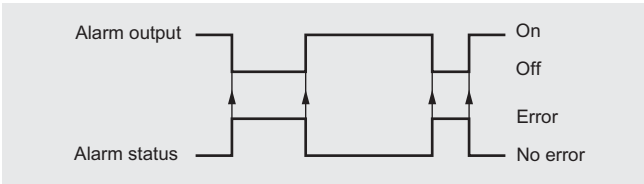
SITRANS FUE380 fulfils the requirements
$E_f = \pm(2 + 0.02\ q_p/q_i)$ max. ± 5%, according to EN 1434 and OIML R75, class 2 revised 1. July 2002

SITRANS FUS380/FUE380/SONOCAL 3000

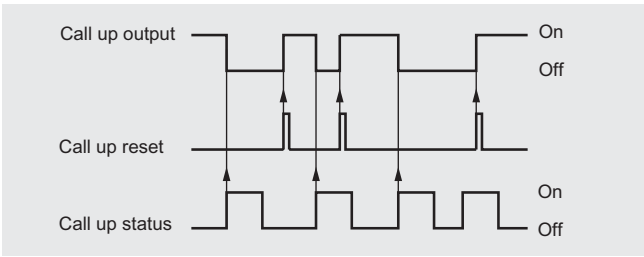
Output configuration SITRANS FUS380/FUE380



Pulse volume: output A/B configured as volume per pulse, calculated on forward/reverse or net forward/reverse flow. The volume per pulse is free scaleable (FUS380 only).



Pulse output B can be used as stated above or as alarm or call up function



Call up: the call up output is active until manually reset by use of PDM program. The callup function is activated when an alarm is activated.

Technical specifications SONOCAL 3000

SONO 3300 CT flow sensor

Accuracy	
Error in measurement at reference conditions; % of measured value	
Dynamic range	
• 1:20	Pulse output ≤ ± 0.5%
• 1:50	Pulse output ≤ ± 3%
Repeatability	≤ ± 0.25%
Maximum flow velocity	10 m/s (32 ft/s)
Nominal size	DN 50, 65, 80, 900, 1000, 1200 (2“, 2,5", 3", 36", 40", 48")
Liquid temperature	-10 … +200 °C (14 … 392 °F) depending on approval
Ambient temperature	-10 … +160 °C (14 … 320 °F) depending on approval
Enclosure	IP67 (NEMA 4X/6)
Process connections	
PN designated, EN 1092-1, type 11, B	• PN 16 (DN 50, 65, 80, 900, 1000, 1200 (2”, 2,5", 3", 36", 40", 48"))
	• PN 25 (DN 900, DN 1000 (36”, 40”))
	• PN 40 (DN 50, 65, 80 (2” ... 3”))
Transducers	Integrated version welded into the pipe
Materials	
Pipe	• DN 50 ... DN 80 (2” ... 3”): Steel GS-16 Mn5, mat. No. 1.1131
	• DN 900 ... DN 1200 (36” ... 48”): Steel EN 1.0345
Flange	• DN 50, 65, 80, 900, 1000, 1200 (2”, 2,5", 3", 36", 40", 48"): Steel EN 1.0025-S235JRG2
Tranducers	Stainless steel AISI 316 or similar
Certificates and approvals	
Material certificates	The sensor is supplied with a Siemens Certificate of Conformity
Custody transfer	PTB class C, OIML R75 class 4, many other local approvals

The sensors are approved according to EU Directive 97/23/EC dated 29 May 1997 regarding fluid in group 1, classified in category III. Design EN 13480.

Coaxial cable

The first 0.5 m (19.7 inch) of the coaxial cable	
Diameter	5.3 mm (0.21”)
Length	0.5 m (19.7”)
Material	PTFE
Ambient temperature	-200 … +200 °C (-328 ... +392 F)
Coaxial cable > 0.5 m (19.7 inch)	
Diameter	5.8 mm (0.23”)
Length	9.5 m (30.4 ft) Total max. length 10 m (32 ft)
Material	PE
Ambient temperature	-40 … +70 °C (-40 ... +158 °F)

SONO 3000 CT transmitter without display

Output	
Analog output	Individually galvanically isolated, isolation voltage 500 V
• Measurement of	Volume flow
• Current	4 ... 20 mA
• Load	< 800 Ω
• Time constant	5 s
Pulse output	Individually galvanically isolated, isolation voltage 500 V
• Measurement of	Volume flow
• Pulse width	5 ms
Pulse values	1-2.5-100 l/pulse depending on size, see selection guide
Output mode	
• Passive	5 ... 30 V/max. 200 mA
Relay output	
• Time constant/hysteresis	5 s/0.5% F.S.O.
• Change-over relay	Error indication
• Load	42 V, 0.5 A
Cut-off: low flow	0.8% F.S.O.

Rated operation conditions	
Ambient temperature	
• IP67 (NEMA 4X/6) version	
- Storage	-40 ... +85 °C (-40 ... +185 °F)
Mechanical vibrations	2 g, 1 .. 800 Hz sinusoidal in all directions to IEC 68-2-6
Degree of protection (enclosure)	IP67 (NEMA 4X/6) to EN 60529 and DIN 40050
Design	
Enclosure material	Fibre glass reinforced polyamide
Dimensional drawings and weight	See dimensional drawings
Power supply	
Supply voltage and power consumption	115 … 230 V +10%/-15%, 50 ... 60 Hz, 10 ... 20 VA
Certificates and approvals	
EMC	Emission EN 61000-6-4 Immunity EN 61000-6-2
Low voltage	Acoording to EN 61010-1
Approvals	
IP67 (NEMA 4X/6) version	PTB, class C, OIML R75, class 4

Selection guide SITRANS F US SONOCAL series 3000 flow part (DN 50, 65, 80, 900, 1000, 1200) with standard settings

Flowmeter size nominal to EN 1092-1			**DN 50**	**DN 65**	**DN 80**	**DN 900**	**DN 1000**	**DN 1200**
Flow range	Q_{max} (Qs)	m^3/h	45	72	120	6000	6000	7200
	Q_n (Qp)	m^3/h	36	60	100	5000	5000	6000
	Q_{min}	m^3/h	0.31	0.44	0.7	112	112	162
Flowrate at 20 mA	Q_{20mA}	m^3/h	36	60	100	5000	5000	6000
Pulse output		l/pulse	1	1	2.5	100	100	100

SITRANS FUS380/FUE380/SONOCAL 3000

Selection and Ordering data	Order-No.	Order code
Flowmeter SITRANS FUS380 (standard)	7ME3400 -	
Flowmeter SITRANS FUE380 (type approved)	7ME3410 -	
Flowmeter SITRANS F US SONOCAL 3000	7ME3320 -	

SITRANS FUS380 (standard) 7ME3400

Diameter	Qp [m³/h]	Qs [m³/h]	
DN 100 / 4"	60	60	1 N
DN 100 / 4"	60	180	1 Q
DN 100 / 4"	120	240	1 R
DN 125 / 5"	100	100	1 S
DN 125 / 5"	100	280	1 U
DN 125 / 5"	200	400	1 V
DN 150 / 6"	150	150	2 A
DN 150 / 6"	150	420	2 C
DN 150 / 6"	300	560	2 D
DN 200 / 8"	250	250	2 E
DN 200 / 8"	250	700	2 G
DN 200 / 8"	500	900	2 H
DN 250 / 10"	400	400	2 J
DN 250 / 10"	400	1120	2 L
DN 250 / 10"	800	1400	2 M
DN 300 / 12"	560	560	2 N
DN 300 / 12"	560	1560	2 Q
DN 300 / 12"	1120	2100	2 R
DN 350 / 14"	750	750	2 S
DN 350 / 14"	750	2100	2 U
DN 350 / 14"	1500	2800	2 V
DN 400 / 16"	950	950	3 A
DN 400 / 16"	950	2660	3 C
DN 400 / 16"	1900	3600	3 D
DN 500 / 20"	1475	1475	3 J
DN 500 / 20"	1475	4130	3 L
DN 500 / 20"	2950	5500	3 M
DN 600 / 24"	2150	2150	3 S
DN 600 / 24"	2150	6020	3 U
DN 600 / 24"	4300	8000	3 V
DN 700 / 28"	2900	2900	4 E
DN 700 / 28"	2900	8120	4 G
DN 700 / 28"	5800	10800	4 H
DN 800 / 32"	3800	3800	4 N
DN 800 / 32"	3800	10640	4 Q
DN 800 / 32"	7600	14200	4 R

SITRANS FUE380 (type approved) 7ME3410

Diameter	Qp [m³/h]	Qs [m³/h]	
DN 100 / 4"	60[1]	120	1 P
DN 100 / 4"	60[1]	180	1 Q
DN 100 / 4"	120[2]	180	1 R
DN 125 / 5"	100[1]	200	1 T
DN 125 / 5"	100[1]	280	1 U
DN 125 / 5"	200[2]	280	1 V
DN 150 / 6"	150[1]	300	2 B
DN 150 / 6"	150[1]	420	2 C
DN 150 / 6"	300[2]	420	2 D
DN 200 / 8"	250[1]	500	2 F
DN 200 / 8"	250[1]	700	2 G
DN 200 / 8"	500[2]	700	2 H
DN 250 / 10"	400[1]	800	2 K
DN 250 / 10"	400[1]	1120	2 L
DN 250 / 10"	800[2]	1120	2 M
DN 300 / 12"	560[1]	1120	2 P
DN 300 / 12"	560[1]	1560	2 Q
DN 300 / 12"	1120[2]	1560	2 R
DN 350 / 14"	750[1]	1500	2 T
DN 350 / 14"	750[1]	2100	2 U
DN 350 / 14"	1500[2]	2100	2 V
DN 400 / 16"	950[1]	1900	3 B
DN 400 / 16"	950[1]	2660	3 C
DN 400 / 16"	1900[2]	2660	3 D
DN 500 / 20"	1475[1]	2950	3 K
DN 500 / 20"	1475[1]	4130	3 L
DN 500 / 20"	2950[2]	4130	3 M
DN 600 / 24"	2150[1]	4300	3 T
DN 600 / 24"	2150[1]	6020	3 U
DN 600 / 24"	4300[2]	6020	3 V
DN 700 / 28"	2900[1]	5800	4 F
DN 700 / 28"	2900[1]	8120	4 G
DN 700 / 28"	5800[2]	8120	4 H
DN 800 / 32"	3800[1]	7600	4 P
DN 800 / 32"	3800[1]	10640	4 Q
DN 800 / 32"	7600[2]	10640	4 R

SITRANS F US SONOCAL 3000 7ME3320

Diameter	Qp [m³/h]	Qs [m³/h]	
Cast steel, mat. no. 1.1131/GS-16Mn5			
DN 50	36	45	1 C
DN 65	60	72	1 G
DN 80	100	120	1 L
Carbon steel, mat. no. 1.0345/P235GH			
DN 900	5000	6000	5 C
DN 1000	5000	6000	5 L
DN 1200	6000	7200	5 U

Flange norm and pressure rating	
No pipe (only FUS080)	A
EN 1092-1	
PN 16 (DN 50 ... 1200)	C
PN 25 (DN 200 ... 1000)	D
PN 40 (DN 50 ... 250)	E

Compact / remote connection	
Compact version, max. 120 °C (248 °F) FUS380/FUE380 only	0
Remote version, SONOCAL 3000 with 10 m (32.8 ft) cable	1
Remote version, max. 200 °C (392 °F)	
5 m (16.4 ft)	2
10 m (32.8 ft)	3
20 m (65.6 ft)	4
30 m (98.4 ft)	5

SITRANS FUS380/FUE380/SONOCAL 3000

Selection and Ordering data	Order-No.	Order code
Flowmeter SITRANS FUS380 (standard)	7ME3400-	
Flowmeter SITRANS FUE380 (type approved)	7ME3410-	
Flowmeter SITRANS F US SONOCAL 3000	7ME3320-	
Approvals / pulse output		
Without approval (neutral) Selectable pulse output (SONOCAL 3000 standard)	0	
Only FUE380 and SONOCAL 3000		
With approval marks Selectable pulse output (SONOCAL 3000 standard)	1	
With approval marks and seal Selectable pulse output (SONOCAL 3000 standard)	2	
Without approval (neutral) (FUE380 only) Preset pulse output for FUE950 energy meter	3	
With approval marks (FUE380 only) Preset pulse output for FUE950 energy meter	4	
With approval marks and seal (FUE380 only) Preset pulse output for FUE950 energy meter	5	
Pulse value for SITRANS FUE950		
1 l/pulse (SONOCAL 3000 DN 50...DN 65)	2	
2.5 l/pulse (SONOCAL 3000 DN 80) (DN 100, DN 125 SITRANS FUE380)	3	
10 l/pulse (DN 150 ... DN 250 SITRANS FUE380)	4	
50 l/pulse (DN 300 ... DN 400 SITRANS FUE380)	5	
100 l/pulse (SONOCAL DN 900...1200) (DN 500 ... DN 800 SITRANS FUE380)	6	
Pulse value FUS380/FUE380		
250 l/pulse	7	
1 m^3/pulse	8	
0.5 l/pulse	9	N0B
5 l/pulse	9	N0C
25 l/pulse	9	N0D
500 l/pulse	9	N0E
2.5 m^3/pulse	9	N0F
5 m^3/pulse	9	N0G
10 m^3/pulse	9	N0H
25 m^3/pulse	9	N0J
50 m^3/pulse	9	N0K
100 m^3/pulse	9	N0L
250 m^3/pulse	9	N0M
500 m^3/pulse	9	N0N
1000 m^3/pulse	9	N0P
Transmitter Blind SONO 3000 CT		
IP67/NEMA4X/6, 115 ... 230 V AC SONOCAL 3000	A	
Transmitter SITRANS FUS080/FUE080		
IP67/NEMA 4X/6 115 ... 230 V AC	B	
IP67/NEMA 4X/6 (3.6 V battery supply)	D	
IP67/NEMA 4X/6 115 ... 230 V AC, including 3.6 V battery back up	E	
IP67/NEMA 4X/6 3.6 V battery version (no battery included)[3]	G	
Country / approval type [4]		
No approval mark	A	
Only FUE380		
Denmark, EN 1434/OIML R75	E	
Russia, EN 1434/OIML R75	M	

Selection and Ordering data	Order-No.	Order code
Flowmeter SITRANS FUS380 (standard)	7ME3400-	
Flowmeter SITRANS FUE380 (type approved)	7ME3410-	
Flowmeter SITRANS F US SONOCAL 3000	7ME3320-	
Country/ Approval-type SONOCAL 3000 only		
Austria / OE01 C 050	B	
Croatia / HR Q-1-1002	C	
Czech Republic / TCM 142/97-2741	D	
Denmark / TS 27.01 076 (OIML R75)	E	
Finland	F	
Germany / 2216 9802 (PTB)	G	
Hungary /Th-8290/4/2004	H	
Latvia	J	
Poland / ZT 597/2003	K	
Romania / RO 176/98	L	
Russia / 16373/1 (OIML R75)	M	
Switzerland / ZW 138	N	
Ukraine	P	
Yugoslavia / Q-2-17	Q	
China	Z	Q0C
Slovak Republic	Z	Q0L
Pulse width setup		
5 ms (always for SONOCAL 3000)	0	
5 ms (standard for SITRANS FUE950)	2	
10 ms	3	
20 ms	4	
50 ms	5	
100 ms	6	
200 ms	7	
500 ms	8	

1) EN 1434 flow values
2) OIML R75 flow values
3) Lithium batteries are subject to special transportation regulations according to United Nations "Regulation of Dangerous Goods, UN 3090 and UN 3091". Special transport documentation is required to observe these regulations. This may influence both transport time and costs.
4) Other countries in progress

Please also see www.siemens.com/SITRANSFordering for practical examples of ordering.

SITRANS FUS380/FUE380/SONOCAL 3000

Selection and Ordering data	Order code
Additional information	
Please add „-Z“ to Order No. and specify Order code(s) and plain text.	
Verification FUE380	
Verification certificate 2 x 3 points. Max. flow 50 ... 250 m^3/h depending on dimension	**D10** [1]
Verification certificate 2 x 3 points. Max flow 250 ... 1300 m^3/h depending on dimension	**D11** [1]
Verification certificate 2 x 3 points. Max flow 1400 ... 4200 m^3/h depending on dimension	**D12** [1]
Accredited Siemens calibration FUS380/FUE380	
Accredited Siemens ISO/IEC 17025 calibration. Max. flow 50 ... 250 m^3/h, depending on dimension	**D20**
Accredited Siemens ISO/IEC 17025 calibration Max. flow 250 ... 1300 m^3/h depending on dimension	**D21**
Accredited Siemens ISO/IEC 17025 calibration Max. flow 1400 ... 4200 m^3/h depending on dimension	**D22**
Verification SONOCAL 3000	
Verification certificate: 2 x 3 points, DN 50 ... DN 80 (Max. flow 36 ... 180 m^3/h depending on dimension)	**D10**
Verification certificate: 2 x 3 points, DN 900 ... DN 1200 (Max. flow 4300 m^3/h)	**D12**
Accredited Siemens calibration SONOCAL 3000	
Accredited Siemens ISO/IEC 17025 calibration DN 50 ... DN 80, (Max. flow 36 ... 180 m^3/h dep. on dim.)	**D20**
Accredited Siemens ISO/IEC 17025 calibration DN 900 ... DN 1200, (Max. flow 4300 m^3/h)	**D22**
Accredited third party calibration SONOCAL 3000	
Accredited third party calibration SONOCAL 3000	**D30**
Accredited - Third party ISO/IEC 17025 calibration DN 50 ... DN 80, (Max. flow 36 ... 180 m^3/h dep. on dim.)	
Accredited - Third party ISO/IEC 17025 calibration DN 900 ... DN 1200, (Max. flow 7000 m^3/h)	**D32**
Material certificate	
EN 10204-3.1.B	**F10**
Tag name plate	
Stainless steel tag with 12 mm characters, max. 15 characters (add plain text)	**Y17**
Self-adhesive plastic tag with 8 mm characters, max. 15 characters (add plain text)	**Y18**

[1] Only selectable in SITRANS FUE380

MLFB Ordering example

Customer requires a flowmeter for custody transfer:

- DN 250, PN 25, compact version (media temperature max. 120 °C), battery version.
- Type approved according to EN 1434, verified and sealed.
- Pulse output for energymeter SITRANS FUE950.

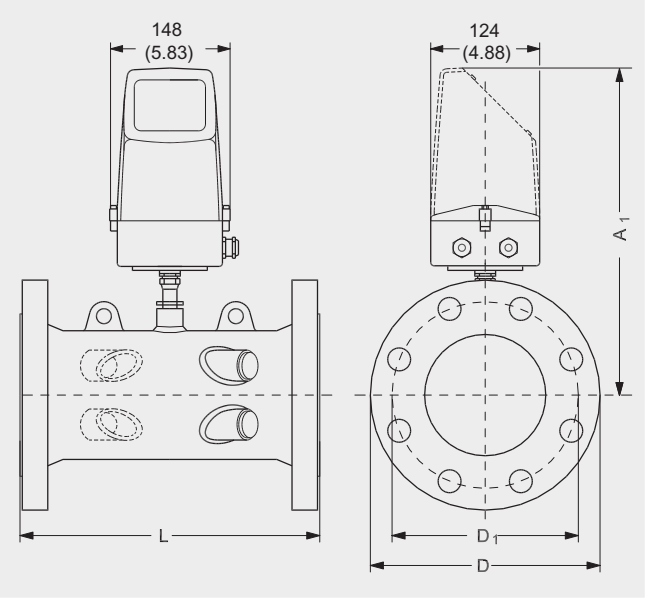
Ordering:

FUE380: **7ME3410-2KD05-4DE2**

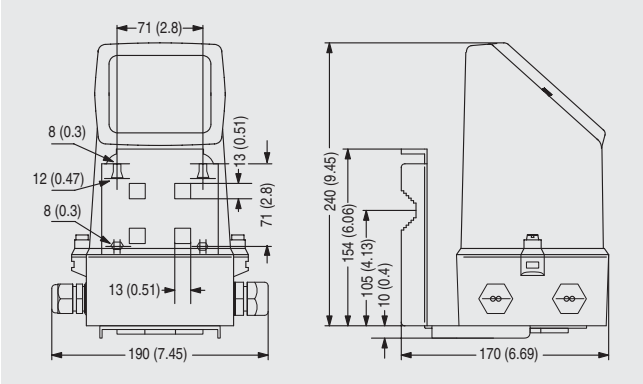
Example of appropriate energy meter:

Energy meter type: **FUE950-03110-0R1CB-10300-DK2-00012**

Dimensional drawings



Transmitter IP67/NEMA 4X/6, wall mounting



Pipe Dimensions

Size	PN 16		PN 25		PN 40					
	L	Weight	L	Weight	L	Weight	A1	D	D_1	Lift hug
DN	mm	kg	mm	kg	mm	kg	mm	mm	mm	
100	350+0-2	20	-	-	350+0-3	16.5	361	220	180	No
125	350+0-2	23	-	-	350+0-3	53	374	250	210	No
150	500+0-3	26	-	-	500+0-3	32	388	285	240	Yes
200	500+0-3	38	500+0-3	47	500+0-3	55	414	340	295	Yes
250	600+0-3	60	600+0-3	76	600+0-3	91	440	405	355	Yes
300	500+0-3	66	500+0-3	81	-	-	466	460	410	Yes
350	550+0-3	94	550+0-3	121	-	-	-	-	-	-
400	550+0-3	124	550+0-3	153	-	-	507	580	525	Yes
500	625+0-3	190	625+0-3	244	-	-	558	715	650	Yes
600	750+0-3	303	750+0-3	365	-	-	609	840	770	Yes
700	875+0-3	361	875+0-3	552	-	-	660	910	840	Yes
800	1000+0-3	494	1000+0-3	770	-	-	710	1025	950	Yes

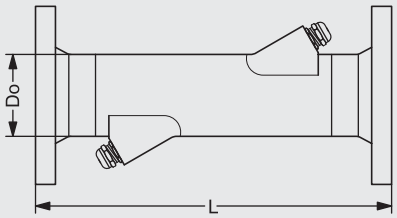
Weight electronics 1.5 kg (3.3 lb)

Size	PN 16		PN 25		PN 40					
	L	Weight	L	Weight	L	Weight	A1	D	D_1	Lift hug
inch	inch	lb	inch	lb	inch	lb	inch	inch	inch	
4	13.77+0-0.08	44	-	-	13.77+0-0.12	36	14.21	8.66	7.09	No
5	13.77+0-0.08	50	-	-	13.77+0-0.12	117	14.72	9.84	8.27	No
6	19.68+0-0.12	57	-	-	19.68+0-0.12	71	15.28	11.22	9.45	Yes
8	19.68+0-0.12	84	19.68+0-0.12	104	19.68+0-0.12	121	16.30	13.39	11.61	Yes
10	23.62+0-0.12	132	23.62+0-0.12	168	23.62+0-0.12	201	17.32	15.94	13.98	Yes
12	19.68+0-0.12	146	19.68+0-0.12	179	-	-	18.35	18.11	16.14	Yes
14	21.65+0-0.12	207	21.65+0-0.12	267	-	-	-	-	-	-
16	21.65+0-0.12	273	21.65+0-0.12	337	-	-	19.96	22.83	20.67	Yes
20	24.61+0-3	419	24.61+0-3	538	-	-	21.97	28.15	25.59	Yes
24	29.53+0-0.12	668	29.53+0-0.12	805	-	-	23.98	33.07	30.31	Yes
28	34.45+0-0.12	796	34.45+0-0.12	1217	-	-	25.98	35.83	33.07	Yes
32	39.37+0-0.12	1089	39.37+0-0.12	1698	-	-	27.95	40.35	37.40	Yes

Weight electronics 1.5 kg (3.3 lb) - Means not available

SITRANS FUS380/FUE380/SONOCAL 3000

SONO 3300 CT sensor flow part



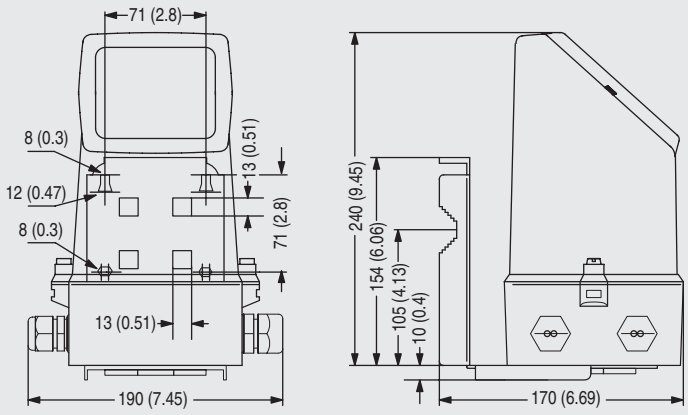
Size	Build-in length L between the flanges			Do Outside diameter	Pipe wall thickness for[1]		
DN	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	[mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]
50	465 ±3	475 ±3	475 ±3	66.6	7.0	7.0	7.0
65	460 ±3	475 ±3	475 ±3	78.0	7.0	7.0	7.0
80	380 ±3	400 ±3	400 ±3	92.0	7.0	7.0	7.0
900	1230 ±6	1300 ±6	-	914.0	8.8	13.3	-
1000	1300 ±6	1370 ±6	-	1016.0	9.7	14.3	-
1200	1360 ±6	-	-	1220.0	11.3	-	-

[1] The stated wall thickness for DN 200 ... DN 1200 are minimum values according to the EC Directive on the Pressure Equipment 97/23/EC.

Weight of SONO 3300 CT sensor

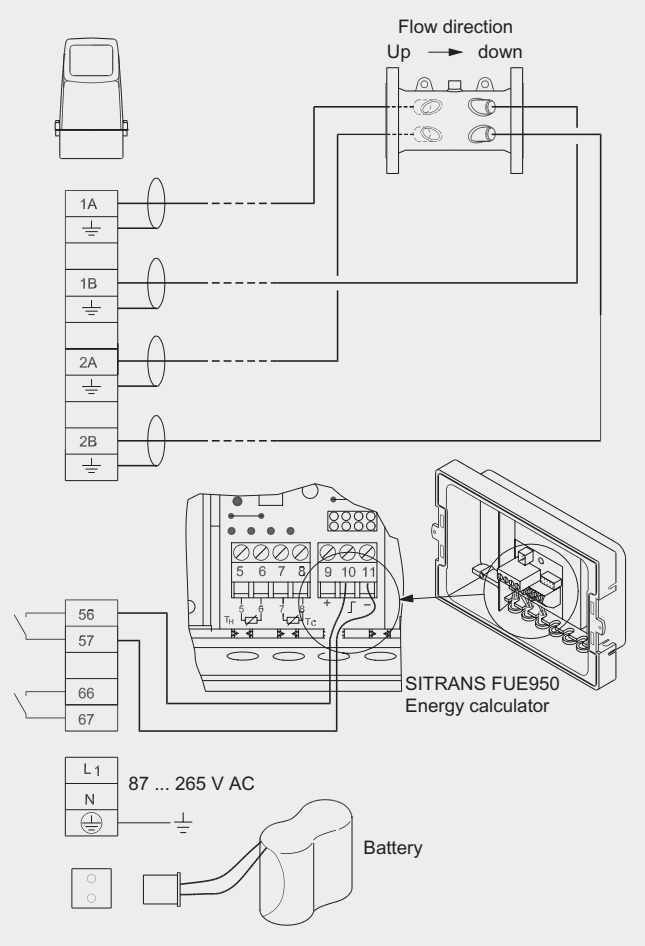
Size		Weight					
		PN 16		PN 25		PN 40	
DN	inch	kg	lbs	kg	lbs	kg	lbs
50	2	13	28.6	14	30.8	14	30.8
65	2½	15	33	16	35.3	16	35.3
80	3	18	39.7	19	42	19	42
900	36	475	1047	835	1841	-	-
1000	40	594	1309	1078	2377	-	-
1200	48	732	1614	-	-	-	-

SONO 3000 CT transmitter, IP67 (NEMA 4X/6), wall mounting



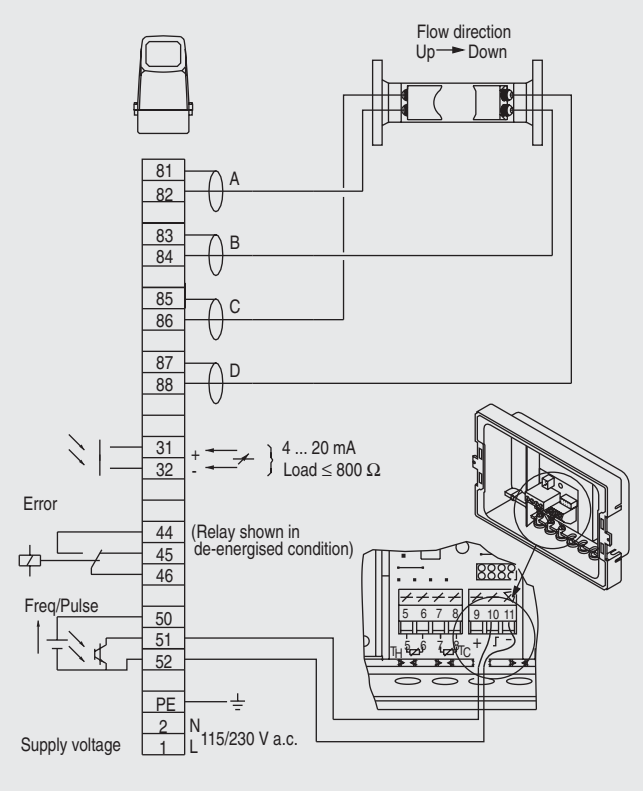
Add approximately 30 mm (1.18 inch) on each side for cabling, approx. 2 kg (4.4 lb).

Schematics SITRANS FUS380



The scheme shows the transducer cable connections between transmitter terminals and respective transducer and the electrical connection of the energy calculator SITRANS FUE950.

Schematics SONOCAL 3000



Electrical connections

SITRANS FUE950 energy calculator

Overview

SITRANS FUE950 is a universal thermal energy calculator, which meets the requirements of OIML R75 class 4 and EN 1434. SITRANS FUE950 has been developed for the SITRANS F US SONOCAL 3000 flow part, SITRANS FUE380 and alternative MAG 5000/6000.

SITRANS FUE950 is modular in construction and can by order be fitted with optional modules depending on the application.

SITRANS FUE950 can be used for up to 25,000 m^3/h.

Benefits

Basic functions

- High accuracy thermal energy metering
- Optical data reading in accordance with EN 1434
- Choice of battery, 230 V AC or 24 V AC
- Instantaneous values for energy/volume flow
- 24 months memory
- Error logging with date and time

Additional functions

- Battery back up of real time clock in the event of power failure
- Tariff functions
- Read-out of account date

Add-on modules

- Plug-in module with data output, pulse output for accumulated energy and water or output signal for failure
- Plug-in module with data output and 2 extra pulse inputs
- Plug-in module for M-bus communication and 2 extra pulse inputs

Advanced functions for cooling/heating applications

- Separate totalizer registers for cooling/heating applications
- Zero point calibration of $\Delta\theta$ for cooling systems

Application

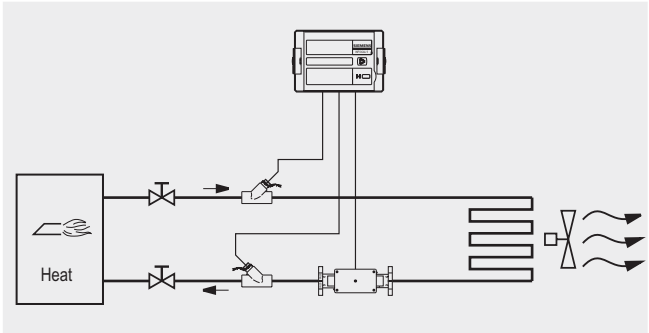
Energy calculation in:

- District heating applications
- Chilled water applications
- Combined cooling/heating applications

Application

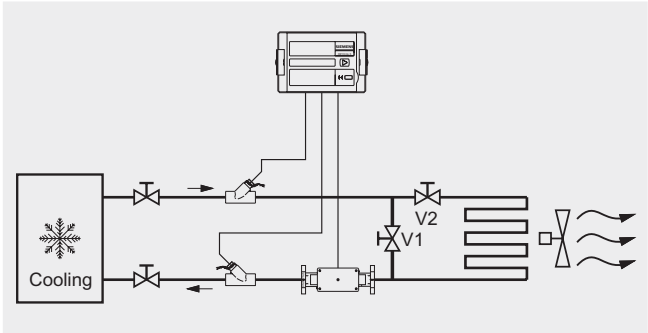
SITRANS FUE950 is able to handle 3 types of applications:

Type: OF/OR:



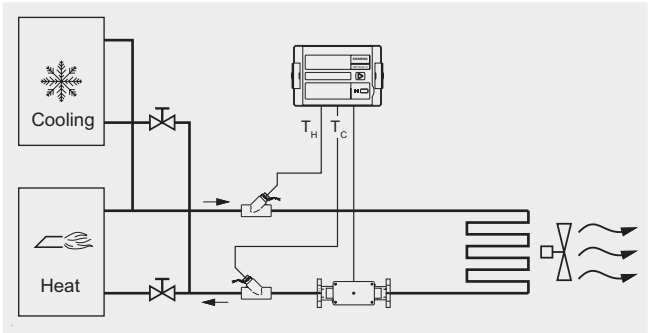
Hot water applications

Type: CF/CR:



Chilled water applications

Type: SF/SR:



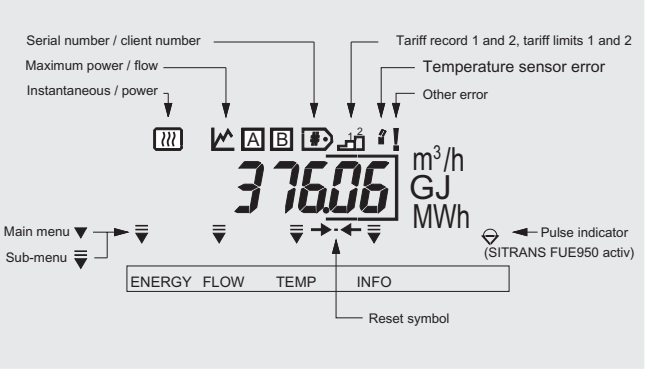
Combined cooling/heating applications

SITRANS FUE950 energy calculator

Design

SITRANS FUE950 has an easy-read 8-digit LCD display with associated pictograms for the various functions. As the display has been made for several applications, there will be figures/ symbols which are not used for normal district heating applications.

SITRANS FUE950 has only one operating button. The display will always be configured for the application chosen, and for the selected display settings. In normal operation, the display will show cumulative energy values.



Function

Technical

Calculation of energy is based on the following formula:

Energy = Volume x (T_{Hot} - T_{Cold}) x K_{factor} (T_i)

Volume: Volume [m^3] of a given amount of water

T_{Hot}: Measured temperature in the flow

T_{Cold}: Measured temperature in the return

K_{factor} (T_i): Thermal coefficient of enthalpy and heat content

The energy calculation is made by a counter and depends on flowmeter size, pulse frequency and legal requirements.

The calculator always carries out at least one energy calculation every 10 minutes if the flowmeter has not sent enough pulses to prompt an energy calculation.

Permanent memory/account date reading

The LOG of the calculator is read every 10 minutes with all cumulative values: Date, Σ energy, Σ water, Σ records 1 and 2, peak values of energy or flow, counter records A and B, date/time and info code.

Energy/volume

Maximum

Energy and volume can be outputted for the previous three months with associated dates when the maximum power occurred. Integration time can be set to 15, 30 or 60 minutes.

Standard factory setting: peak volume: 15 minutes.; peak energy: 60 minutes.

Error handling

If SITRANS FUE950 records an error, this will be indicated by a "!".

The following errors can be detected:

- F1 Forward temperature sensor is interrupted or short-circuited.
- F2 Return temperature sensor is interrupted or short-circuited.
- F3 Internal equipment error.
- F4 Differential temperature high and no flow for 48 hours.
- F5 Water flow exceeds preset Q_s.

Zero point calibration of differential temperature (only types CF/CR)

Cooling systems always operate with a small Δt and a relatively high flow rate. For technical reasons no sensor pair provides completely accurate temperature difference measurements when the sensor temperature difference between forward and return flow is close to zero.

SITRANS FUE950 type CF/CR contains a special zero point calibration routine that can be activated in order to minimize the temperature difference measuring failure.

Normally the zero point calibration is not needed, but can be activated out in order to obtain maximum accuracy in the energy calculation.

The zero point calibration function requires a short circuit between forward and return sensor in the cooling system – e.g. by installing a valve V1 (See application drawing).

Optical output

SITRANS FUE950 is fitted with an optical infra-red send/receive port in accordance with IEC 61107.

Protocol standard, EN 60870-3 (M-bus protocol).

A reader head with a permanent magnet in accordance with EN 1434 can be used for programming/altering programming of readout data, configuration data, etc. The reader head can also be used to change measuring data.

Add-on modules

BUS communication

SITRANS FUE950 needs a special adapter cable to communicate with a PC. To access the terminals, it is necessary to use one of the supplementary modules – pulse output or input module, which, in addition to specific terminals - both have 3 terminals for connection to a PC.

Pulse output module

Module contains 3 terminals for DATA, REQUEST and GND. There are also 2 x 2 terminals for CE, CV/Alarm. Both outputs are galvanically separated.

Pulse sequence CE: 1 pulse per change in the least significant digit in the energy unit and resolution selected.

Pulse sequence CV: 1 pulse per change in the least significant digit in the volume unit and resolution selected.

Pulse input module/flow 2

If flowmeter 2 is used in a heating system, flowmeter 1 must always be placed in the flow and flowmeter 2 in the return.

The module contains 3 terminals for flowmeter 2. 3 terminals for DATA, REQUEST and GND.
2 x 2 terminals for counters A and B, and 3 terminals for flow 2 input.

M-bus module

The M-bus protocol is in accordance with EN 1434-3 and EN 60870-5.

For communication with an M-bus, it is necessary to fit SITRANS FUE950 with an add-on module.

The M-bus module contains, in addition to terminals for BUS connection, terminals for counter inputs A and B.

Fitting /Installation

SITRANS FUE950 can only be wall mounted or panel mounted.

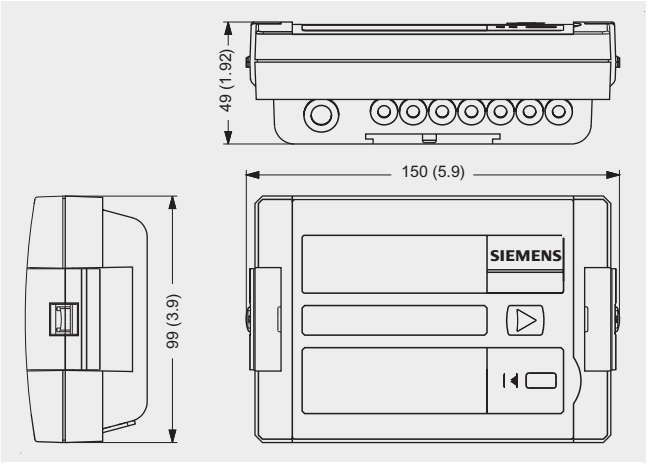
Integration

SITRANS FUE950 is a multi-purpose energy calculator which meets the requirements of EN 1434. Further, the energy calculator has been specially developed to receive volume pulses from SONOCAL 3000 flow part and SITRANS FUE380, alternative MAG 5000/6000.

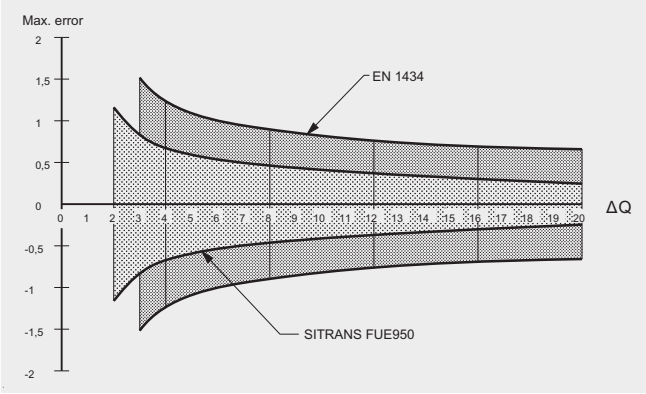
SITRANS FUE950 energy calculator

Technical specifications

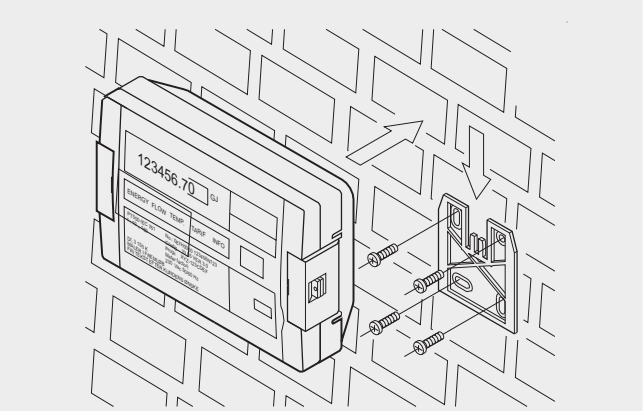
Approved in accordance with	Heat meter EN 1434	Chilled water EN 1434 pr. A1
Temperature range	θ: 0 ... 170 °C	Δθ: 2 ... 20K
Differential temperature	θ: 3 ... 150 K	Δθ: 2 ... 20K
Accuracy	Max. ± (0.5 + 3K/Δθ) [%]	
Flow range	Q_n (qp) ≤ 25,000 m^3/h	
Environment class	A	
Temperature input		
Measuring range	0 ... 170 °C (32 … 338 °F)	
Differential temperature	1 ... 170 K (1.8 … 306 °F)	
Sensor type	Pt500	
Sensor connection	2 wire	
Measurement resolution	0.01 °C (0.018 °F)	
Flow input 1		
Pulse/frequency	≤ 400 Hz (The combined pulse frequency at flow 1, in A and B may not exceed 400 Hz, whether they are used one at a time or simultaneously.)	
Pulse ON time	≤ 0.5 ms	
Pulse OFF time	≤ 1.5 ms	
Bus output		
Protocol	EN 60870-5	
Connection	Open collector, 2400/300 baud, 3.6 V	
Optical connection		
Protocol	EN 60870-5	
Connection	Optical eye, 600 baud, EN 61107	
Pulse output CE and CV/Alarm		
ON time	> 30ms	
ON Current	≤ 10 mA	
External supply	≤ 24 V DC	
OFF time with alarm	Approx. 1 hour	
Supply data		
Internal voltage	3.6 +0.1/-0.4 V DC	
Current consumption	Typically 45 µA	
Battery	3.6 V lithium D cell	
Battery lifetime	Typically 8 years, 10 years with independently powered flowmeter	
Power supply	230 V AC +15/-30% 50/60 Hz 24 V AC	
Battery backup	3.0 V CR 2032 cell (only in calculators with extra funtions - MM = 0A,T0,TA)	
Environment/safety		
Generally	EN 1434	
Ambient temperature	5 ... 55 °C (41 °F … 131 °F)	
Storage temperature	-25 ... +70 °C (-13 … +158 °F)	
Enclosure	IP54 in accordance with IEC 529	
Vibrations	1g, 1 & 1000 Hz in accordance with IEC 68-2-34	
Free fall	IEC 68-2-34	
EMC	EN 1434 (EN 50081-1 / 50082-1)	
Personal safety	EN 60730	
Materials		
Top	PC Lexan 141R Transparent 111	
Pipe/wall fitting	PA 6,6 GF25	
Other plastic parts	ABS Cycolac GPM500	
Gaskets	Neopren	
Rubber bushing	EPDM 50	



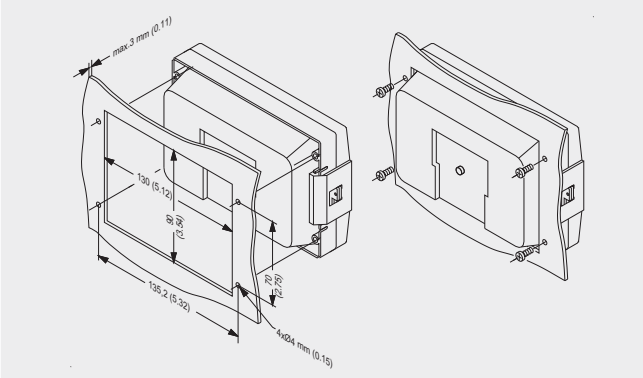
Dimensions



Accuracy curves



Wall mounting



Panel mounting

Selection and Ordering data

Note:

SITRANS FUE950 is not listed in the standard SIEMENS ordering set-up. Therefore, when placing an order for SITRANS FUE950, the **build-up code** mentioned below must be used and sent to order management at Siemens Flow Instruments (SFI). SFI generates an FDK or No. that holds the required data for the order and for the logistics treatment via the order handling system.

Selection and Ordering data			Build-up code
Calculator for SONOCAL [1]			SITRANS FUE950 -
Size	**Q_n: m^3/h**	**l/pulse**	
DN 50	36	1	0 3 0 0 0
DN 65	60	1	0 3 0 1 0
DN 80	100	2.5	0 3 0 3 0
DN 900	5000	100	0 3 2 0 0
DN 1000	5000	100	0 3 2 0 0
DN 1200	6000	100	0 3 2 1 0
Calculator for SITRANS FUE380 [1]			
DN 100	60 ... 180	2.5	0 3 0 6 0
DN 125	100 ... 280	2.5	0 3 0 7 0
DN 150	150 ... 420	10	0 3 0 9 0
DN 200	250 ... 700	10	0 3 1 1 0
DN 250	400 ... 1120	10	0 3 1 2 0
DN 300	560 ... 1560	50	0 3 1 3 0
DN 350	750 ... 2100	50	0 3 1 4 0
DN 400	950 ... 2730	50	0 3 1 5 0
DN 500	1475 ... 4130	100	0 3 1 7 0
DN 600	2150 ... 6020	100	0 3 2 1 0
DN 700	2900 ... 8120	100	0 3 2 2 0
DN 800	3800 ... 10640	100	0 3 2 2 0
Calculator for MAGFLO [1]			
Size		**l/pulse**	
DN 6 ... DN 15		1	0 0 0 1 0 0 0 0
DN 25 ... DN 50		10	0 0 1 0 0 0 0 0
DN 65 ... DN 150		100	0 0 2 6 0 0 0 0
DN 200 ... DN 500		1000	0 0 3 1 0 0 0 0
Calculator			
For district heating, flowmeter in forward pipe			O F
For district heating, flowmeter in return pipe			O R
For chilled water, flowmeter in forward pipe (cold pipe) [1]			C F
For chilled water, flowmeter in return pipe (hot pipe) [1]			C R
For combined cooling/heating, flowmeter in forward pipe (hot pipe in winter) [1]			S F
For combined cooling/heating, flowmeter in return pipe (cold pipe in winter) [1]			S R
Sensor type			
Pt500, no sensor included			1 0
Pt100, no sensor included			3 0
Pt500, 2-wire, pocket sensor, 6 mm:			
• 1.5 m cable			1 C
• 3 m cable			1 D
• 5 m cable			1 E
• 10 m cable			1 F
• 20 m cable			1 G
Temperature sensor pocket sets			
No pockets			0
Brass pocket 40 mm			A
Brass pocket 85 mm			B
Brass pocket 120 mm			C
Steel pocket 85 mm			K
Steel pocket 120 mm			L
Steel pocket 155 mm			M
Steel pocket 210 mm			N

Selection and Ordering data	Build-up code
Calculator for SONOCAL [1]	SITRANS FUE950 -
Voltage supply	
No power supply	0
3.6 V battery supply	1
230 V AC supply	2
24 V AC supply	3
Optional modules	
No modules	0
Data input, input A & B	1
Data output, 2 pulse output	2
M-bus module and input A & B	3
Display units	
GJ	1
KWh (only DN 50)	2
MWh	3
Gcal	4
Extra functions	
Standard (no extra functions)	0 0
Accounting date	0 A
Tariff function	T 0
Tariff and accounting date	T A
Country code	
Neutral	0 0
country code [2]	X X
Verification	
Without type approval mark	0
With type approval mark (country specific)	1
With approval mark and verification	2
With approval mark, verification and certificate	3

[1] No approvals are available for chilled water applications.
[2] Available approvals for SITRANS FUE950 energy calculator: DK (Denmark), DE (Germany)

Please also see www.siemens.com/SITRANSFordering for practical examples of ordering.

SITRANS FUE950 energy calculator

Ordering example

Example:

Calculator for a DN 1000 Qn = 5000 m^3/h SONOCAL 3000 flow part.
- DN 1000
- District heating, flowmeters in forward
- PT 500, 2 wire, pocket sensor with 1.5 m cable
- 210 mm stainless steel
- 230 V AC supply
- Data output and 2 pcs. pulse output
- MWh as unit in the display
- No extra functions
- DE (Germany) as country code
- With approval mark and verification

Please note that SITRANS FUE950 is not a part of the MLFB structure.

The **build-up code** has to be mailed to our customer service in Nordborg and you will get a FDK- numberback which can be used to place the order.

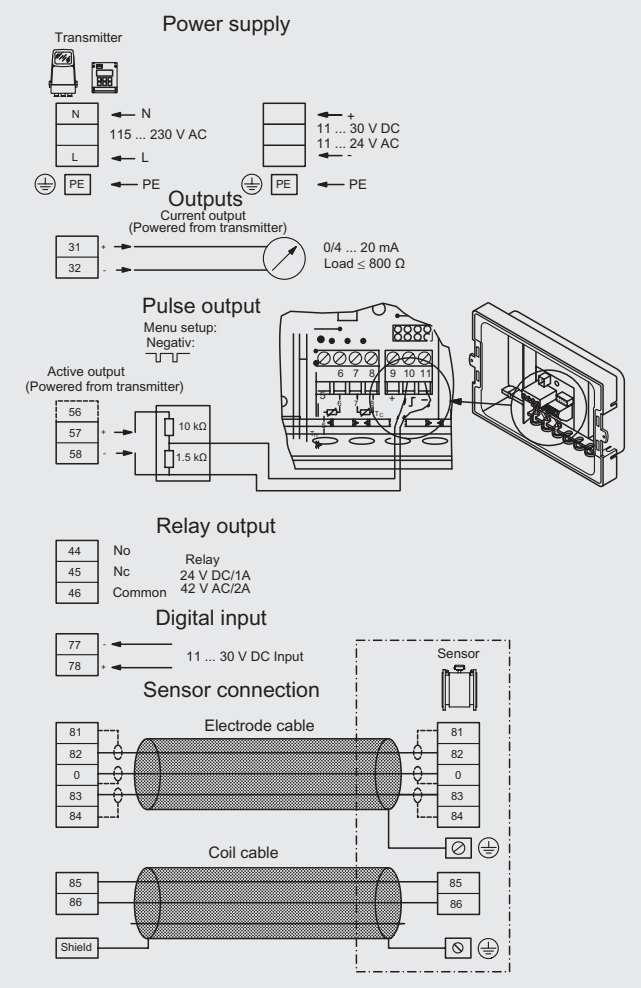
Build up code: **SITRANS FUE950-03210-0F1CN-22300-DE2**

Schematics

Electrical connection for SITRANS FM MAGFLO electromagnetic flowmeters MAG 5000/6000 and SITRANS FUE950 in combination

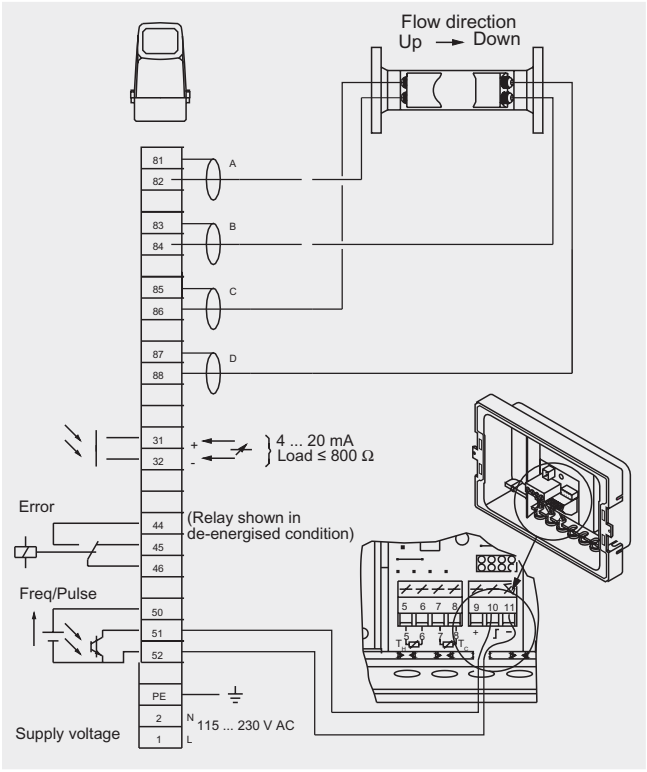
2 resistors are required to obtain a correct transmission of pulses, when MAG 5000/6000 is connected together with a SITRANS FUE950 as a heat meter.

The 2 resistors are to be mounted between terminals 57 and 58 in the MAG terminal socket. Moreover, the resistors used are respectively 10 kΩ and 1.5 kΩ.
Resistors are not part of our accessories list.

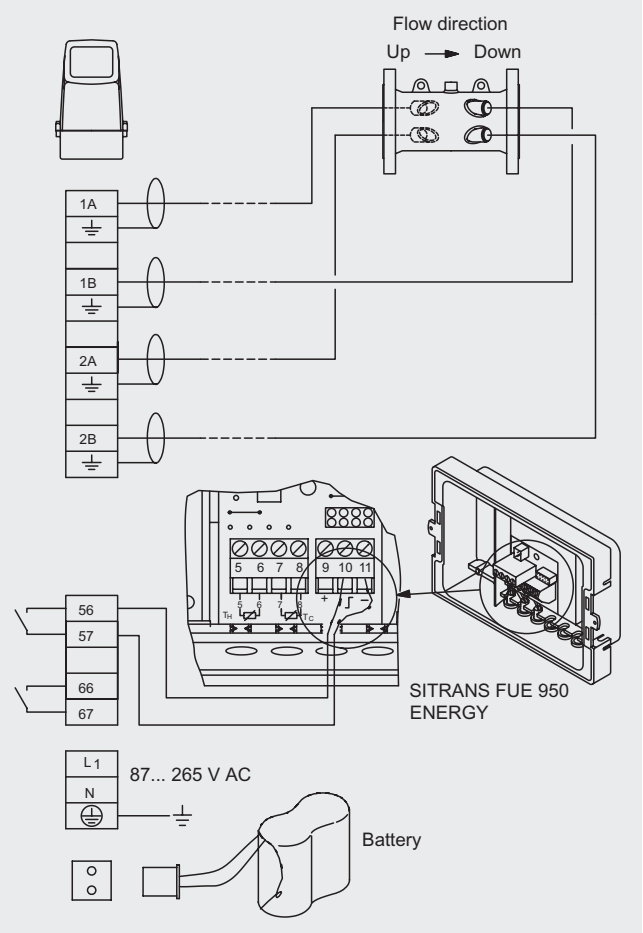


The diagram shows the correct connection between SITRANS FUE950 and MAG 5000/6000.

Electrical connection for SONOCAL series 3000 flow part



Electrical connection for SITRANS FUS380/FUE950



SITRANS FUS880

Overview

The SITRANS FUS880 is a battery-powered irrigation flowmeter, designed for pipes measuring from DN 200 up to DN 1200 (8" up to 48") in diameter. The SITRANS FUS880 gives you the ability to install the flowmeter underground retrofitting onto existing pipelines. This ultrasonic transient time irrigation flowmeter is used for full pipe flow measurements. Pipe material may be PVC or concrete and pipe construction may be single wall or double wall, smooth or corrugated.

The flowmeter produces a signal proportional to the velocity of the flow (flow rate) as the liquid flows past the ultrasonic sensors.

SITRANS FUS880 has transducers in the flow (wetted) which assures superior aides in accuracy and superior performance when compared to doppler or many other types of flow measurement systems.

Benefits

- Cost-effective solution - contains all the necessary components for retrofitting onto existing pipe
- Battery operated - Maintenance free up to 6 years
- SITRANS FUS880 is easy to install in pipeline sizes from DN 200 up to DN 1200 (8" up to 48") in diameter
- The transmitter display shows both accumulated volume and instantaneous flow rate
- The flowmeter provides a digital signal that can be sent directly to a PLC / RTU / DCS
- Solid construction with no moving parts for a 100% maintenance and obstruction free flowmeter
- The SITRANS FUS880 transmitter comes within an IP67 enclosure
- Sensor can easily be buried and withstand constant flooding
- Automatic calculation of the calibration factor when pipe geometry data are entered in the signal transmitter
- Pipe material may be polyvinylchloride (PVC) or concrete
- Pipe construction may be single wall or double wall, smooth or corrugated

Application

- Irrigation systems
- Irrigation distribution systems
- Pumping stations
- Canal laterals
- On-farm outlets
- Water well production
- Drip and sprinkler irrigation
- Center pivot systems
- Potable water

Design

The SITRANS FUS880 set contains all necessary parts to build up an ultrasonic flowmeter on existing pipes depending on choices at ordering:

- Templates to wrap around pipes for alignment of sensors
- Transducer threading tool
- Thread adapters
- Transducer alignment tools
- Mounting plugs or saddles as well as FUS880 transmitter dependant upon the specifics at time of ordering and required mounting hardware
- Cables

Technical specifications

SITRANS FUS880

Accuracy

Typical ≤ ± 2.0%, dependant upon the accuracy of measurements of tube diameter and during installation

Note:

Flow system measurement performance depends on the accuracy of the measurements taken at time of installation. This means that inaccurate measurements of angles, distance between transducers, wall thickness and pipe diameter have a direct effect on the accuracy as these values measured are entered into the memory of the FUS880 transmitter and used in part of the calculation of flow rate.

Requirements for pipes

Size	DN 200 ... DN 1200 (8" ... 48")

Transmitter Enclosure

Rating	IP67 rated enclosure
Material	Fiberglass reinforced polyamide
Terminal box	PA 6.6, 100 °C (212 °F)
Transducer element	AISI 316 Stainless Steel 200 °C (392 °F)
2000 Corrugated PVC	Transducer holder: Polyvinyl chloride Mounting saddle: Polyvinyl chloride
• Line pressure max.	Pressure rating per spec. ASTM D-1784 (5.5 bar (80 psi))
• Liquid temperature max.	Temperature rating per spec. ASTM D-1784 (60 °C (140 °F))
Pro21 Corrugated PVC	Transducer holder: Polyvinyl chloride Mounting saddle: Polyvinyl chloride
• Line pressure max.	Pressure rating per spec. ASTM D-1784 (5.5 bar (80 psi))
• Liquid temperature max.	Temperature rating per spec. ASTM D-1784 (60 °C (140 °F))

PVC Solid PIP 80	Transducer holder: Polyvinyl chloride Mounting saddle: Polyvinyl chloride
• Line pressure max.	Pressure rating per spec. ASTM D-1784 (5.5 bar (80 psi))
• Liquid temperature max.	Temperature rating per spec. ASTM D-1784 (60 °C (140 °F))
Concrete	Transducer holder: Polyvinyl chloride Mounting saddle: Polyvinyl chloride
• Line pressure max.	Pressure rating per spec. ASTM D-1784 (5.5 bar (80 psi))
• Liquid temperature max.	Temperature rating per spec. ASTM D-1784 (60 °C (140 °F)) Structural Epoxy joint meets spec. ASTM D1002 (118 bar or 1710 psi)

Pipe wall thickness	
A2000 Corrugated PVC	25 ... 50 mm (1" ... 2")
Pro21 Corrugated PVC	25 ... 50 mm (1" ... 2")
PVC Solid PIP 80	Less than 25 mm (1")
Concrete	• 51 ... 57 mm (2“ ... 2.25“) • 57 ... 64 mm (2.25“ ... 2.5“) • 70 ... 76 mm (2.75“ ... 3“) • 76 ... 83 mm (3“ ... 3.25“) • 89 ... 95 mm (3.5“ ... 3.75“) • 95 ... 100 mm (3.75“ ... 4“) • 108 ... 114 mm (4.25“ ... 4.50“)

More information

Installation requirement

The space requirements around the pipe for retrofitting an ultrasonic flowmeter type SITRANS FUS880 are given below:

It is important to prepare excavation site for a safe and efficient installation. An underground pipe needs to be exposed so that there is a minimum of 1.52 m (5 ft) or more of working space on either side of the pipe. The length of the trench should exceed the template length by 1.83 m (6 ft) or more.

Pipe support:

Ensure that an unearthed pipe has sufficient support beneath it to prevent deformation or breakage.

Cave-in:

Always brace trench walls. Follow all applicable (e.g. municipal, company, customer, site, union) construction guidelines.

Epoxy:

Follow all safety recommendations listed by the epoxy manufacturer. Use proper protection equipment, such as gloves, safety glasses, clothing, etc. Read the labels on the epoxy cans before mixing. Note all safety related statements and temperature recommendations in particular. For additional information, see the epoxy manufacturer's internet site.

Pipe template:

Templates are printed on a durable material, such as Mylar, and are resistant to normal contaminants. Do not expose the template to excessive moisture or excessive periods of sunlight, heat and cold temperatures. Always roll and store the template in its' shipping tube. Do not stretch or fold as this could permanently damage the template.

Installation overview:

Installation steps

Installation of the SITRANS FUS880 is accomplished with the following steps.

1. Expose and clean the pipe.
2. Mark a centerline on the pipe.
3. Place the template on the pipe and tape it securely to the pipe.
4. Mark the locations of the sensor mounting holes on the pipe.
5. Drill the sensor mounting holes in the pipe.
6. Clean and de-burr the sensor mounting area.
7. Measure up the pipe circumference C, the wall thickness WT and calculate OD and ID.
8. Epoxy and screw the saddle sensor holder to the pipe.
9. Assemble and install the sensors-holders.
10. Measure up the actual sensor-location to see if re-calibration is needed.
11. Assemble and install the sensors.
12. Install sensor wiring and conduit.
13. Install the transmitter and connect the sensor wiring.
14. Check the transmitter configuration.
15. Test the installation thoroughly and run a flow test.
16. Fill in the "Site Acceptance Form".
17. Cover the pipe.

For detailed instruction in installation please refer to User Manual Order no.: FDK:521HAP0553.

SITRANS FUS880

Selection and Ordering data	Order-No.
SITRANS F US SONOFLO Ultrasonic flowmeters	**7ME3440-**
SITRANS FUS880 PVC (Solid) (PIP80) SONOKIT Battery powered	■■■■■-■■■■
Pipe diameter	
DN 200(8")	2F
DN 250 (10")	2K
DN 300 (12")	2P
DN 380 (15")	2V
DN 450 (18")	3F
DN 530 (21")	3M
DN 600 (24")	3T
DN 680 (27")	4D
Wall thickness	
Less than 25 mm (1")	B
Pipe material	
PVC (Solid) (PIP80)	1
Track configuration	
1-track	1
2-track X-configuration	3
Region version	
EU, US	2
Transmitters	
SITRANS FUS080, IP67, Battery powered	D
Template	
Standard	A
Cable length	
20 m (65.6 ft) with gland	4

Selection and Ordering data	Order code
Further designs	
Please add „-Z" to Order No. and specify Order code(s).	
Add on units of measure	
Flow unit GPM	**L01**
Flow unit CFS	**L02**
Flow unit m^3/h	**L03**
Flow unit MGD	**L05**
Volume unit US Gal	**L42**
Volume unit m^3/h	**L44**
Volume unit US Gal x 100	**L46**
Volume unit US Gal x 1000	**L49**
Volume unit US Mgal	**L48**
Volume unit AcF (Acre Feet)	**L43**
Volume unit AcI (Acre Inch)	**L51**

Selection and Ordering data	Order-No.
SITRANS F US SONOFLO Ultrasonic flowmeters	**7ME3440-**
SITRANS FUS880 A2000 Corrugated PVC SONOKIT 1-track Battery powered	■■■■■-■■■■
Pipe diameter	
DN 380 (15")	2V
DN 450 (18")	3F
DN 530 (21")	3M
DN 600 (24")	3T
DN 750 (30")	4K
DN 900 (36")	5B
Wall thickness	
25 ... 50 mm (1" ... 2")	C
Pipe material	
PVC Corrugated A2000	3
Track configuration	
1-track	1
Region version	
EU, US	2
Transmitter	
SITRANS FUS080, IP67, Battery powered	D
Template	
Standard	A
Cable length	
20 m (65.6 ft) with gland	4

Selection and Ordering data	Order code
Further designs	
Please add „-Z" to Order No. and specify Order code(s).	
Add on units of measure	
Flow unit GPM	**L01**
Flow unit CFS	**L02**
Flow unit m^3/h	**L03**
Flow unit MGD	**L05**
Volume unit US Gal	**L42**
Volume unit m^3/h	**L44**
Volume unit US Gal x 100	**L46**
Volume unit US Gal x 1000	**L49**
Volume unit US Mgal	**L48**
Volume unit AcF (Acre Feet)	**L43**
Volume unit AcI (Acre Inch)	**L51**

Selection and Ordering data	Order-No.
SITRANS F US SONOFLO Ultrasonic flowmeters	**7ME3440-**
SITRANS FUS880 Pro21 Corrugated PVC **SONOKIT 1-track** **Battery powered**	■■■■■-■■■■
Pipe diameter	
DN 750 (30")	**4K**
DN 840 (33")	**4P**
DN 900 (36")	**5B**
DN 1050 (42")	**5M**
DN 1200 (48")	**5T**
Wall thickness	
25 ... 50 mm (1" ... 2")	**C**
Pipe material	
PVC Pro21 Corrugated	**2**
Track configuration	
1-track	**1**
Region version	
EU, US	**2**
Transmitter	
SITRANS FUS080, IP67, Battery powered	**D**
Template	
Standard	**A**
Cable length	
20 m (65.6 ft) with gland	**4**

Selection and Ordering data	Order code
Further designs	
Please add „-Z" to Order No. and specify Order code(s).	
Add on units of measure	
Flow unit GPM	**L01**
Flow unit CFS	**L02**
Flow unit m^3/h	**L03**
Flow unit MGD	**L05**
Volume unit US Gal	**L42**
Volume unit m^3/h	**L44**
Volume unit US Gal x 100	**L46**
Volume unit US Gal x 1000	**L49**
Volume unit US Mgal	**L48**
Volume unit AcF (Acre Feet)	**L43**
Volume unit AcI (Acre Inch)	**L51**

Selection and Ordering data	Order-No.
SITRANS F US SONOFLO Ultrasonic flowmeters	**7ME3440-**
SITRANS FUS880 Concrete **SONOKIT 1-track** **Battery powered**	■■■■■-■■■■
Pipe diameter	
DN 300 (12")	**2P**
DN 380 (15")	**2V**
DN 450 (18")	**3F**
DN 530 (21")	**3M**
DN 600 (24")	**3T**
DN 680 (27")	**4D**
DN 750 (30")	**4K**
DN 900 (36")	**5B**
DN 1050 (42")	**5M**
Wall thickness	
51 ... 57 mm (2" ... 2.25")	**D**
57 ... 64 mm (2.25" ... 2.5")	**E**
70 ... 76 mm (2.75" ... 3")	**F**
76 ... 83 mm (3" ... 3.25")	**G**
89 ... 95 mm (3.5" ... 3.75")	**H**
95 ... 100 mm (3.75" ... 4")	**J**
108 ... 114 mm (4.25" ... 4.5")	**K**
Pipe material	
Concrete	**4**
Track configuration	
1-track	**1**
Region version	
EU, US	**2**
Transmitter	
SITRANS FUS080, IP67, Battery powered	**D**
Template	
Standard	**A**
Cable length	
20 m (65.6 ft) with gland	**4**

Selection and Ordering data	Order code
Further designs	
Please add „-Z" to Order No. and specify Order code(s).	
Add on units of measure	
Flow unit GPM	**L01**
Flow unit CFS	**L02**
Flow unit m^3/h	**L03**
Flow unit MGD	**L05**
Volume unit US Gal	**L42**
Volume unit m^3/h	**L44**
Volume unit US Gal x 100	**L46**
Volume unit US Gal x 1000	**L49**
Volume unit US Mgal	**L48**
Volume unit AcF (Acre Feet)	**L43**
Volume unit AcI (Acre Inch)	**L51**

SITRANS FUS880

Selection and Ordering data	Order-No.
Accessories and Spare parts	
SITRANS F US SONOFLO Ultrasonic flowmeters	
FUS880 transmitter includes 2 transducers and 20 m (65.6 ft) of cable	**7ME3440-0AA01-2DA4**
FUS880 Installation pipe template	
Template, PCV. PIP 80	
DN 250 (10“)	**TGX:16347-80**
DN 300 (12“)	**TGX:16347-81**
DN 380 (15“)	**TGX:16347-82**
DN 450 (18“)	**TGX:16347-83**
DN 530 (21“)	**TGX:16347-84**
DN 600 (24“)	**TGX:16347-85**
DN 680 (27“)	**TGX:16347-86**
Template, Concrete	
DN 300 (12“)	**TGX:16347-90**
DN 380 (15“)	**TGX:16347-91**
DN 400 (16“)	**TGX:16347-89**
DN 450 (18“)	**TGX:16347-92**
DN 530 (21“)	**TGX:16347-93**
DN 600 (24“)	**TGX:16347-94**
DN 680 (27“)	**TGX:16347-95**
DN 750 (30“)	**TGX:16347-96**
DN 900 (36“)	**TGX:16347-97**
DN 1050 (42“)	**TGX:16347-98**
Template, pipe DN 900 (36“) PVC, A2000 corrugated	**TGX:16347-100**
Template, pipe DN 1050 (42“) Pro21 corrugated	**TGX:16347-101**
FUS880 Installation spare kit	
Concrete kit, Sensor mounting	
51 ... 57 mm (2“ ... 2.25“)	**TGX:16347-213K**
57 ... 64 mm (2.25“ ... 2.5“)	**TGX:16347-214K**
70 ... 76 mm (2.75“ ... 3“)	**TGX:16347-215K**
76 ... 83 mm (3“ ... 3.25“)	**TGX:16347-216K**
89 ... 95 mm (3.5“ ... 3.75“)	**TGX:16347-217K**
95 ... 100 mm (3.75“ ... 4“)	**TGX:16347-218K**
108 ... 114 mm (4.25“ ... 4.5“)	**TGX:16347-212K**
PVC kit, Sensor Mounting	
DN 300 (12“)	**TGX:16347-219K**
DN 380 (15“)	**TGX:16347-220K**
DN 450 (18“)	**TGX:16347-221K**
DN 530 (21“)	**TGX:16347-222K**
DN 600 (24“)	**TGX:16347-223K**
DN 680 (27“)	**TGX:16347-224K**
Corrugated PVC kit, DN 900 (36“) A2000	**TGX:16347-225K**
Corrugated PVC kit, DN 1050 (42“') Pro21	**TGX:16347-226K**
FUS880 spares	
Holder - Saddle	
DN 250 (10“) PIP 80 PVC Saddle	**TGX:16347-165**
DN 300 (12“) PIP 80 PVC Saddle	**TGX:16347-166**
DN 380 (15“) PIP 80 PVC Saddle	**TGX:16347-168**
DN 450 (18“) PIP 80 PVC Saddle	**TGX:16347-170**
DN 530 (21“) PIP 80 PVC Saddle	**TGX:16347-174**
DN 600 (24“) PIP 80 PVC Saddle	**TGX:16347-175**
DN 680 (27“) PIP 80 PVC Saddle	**TGX:16347-177**

Selection and Ordering data	Order-No.
Holder - Plug	
51 ... 57 mm (2“ ... 2.25“) Cement sensor holder, PVC	**TGX:16347-120**
57 ... 64 mm (2.25“ ... 2.5“) Cement sensor holder, PVC	**TGX:16347-121**
70 ... 76 mm (2.75“ ... 3“) Cement sensor holder, PVC	**TGX:16347-122**
76 ... 83 mm (3“ ... 3.25“) Cement sensor holder, PVC	**TGX:16347-123**
89 ... 95 mm (3.5“ ... 3.75“) Cement sensor holder, PVC	**TGX:16347-124**
102 ... 108 (4" ... 4.25") Cement sensor holder, PVC	**TGX:16347-125**
108 ... 114 mm (4.25“ ... 4.5“) Cement sensor holder, PVC	**TGX:16347-127**
A2000 - DN 900 (36“) ID	**TGX:16347-134**
PRO-21 - DN 1050 (42“) ID	**TGX:16347-135**
Straps -Kits	
Strap kit for -134 & -135 plugs	**TGX:16347-235**
Strap kit for -120, -121, -122, -123 plugs	**TGX:16347-236**
Strap kit for -124 & -125 plugs	**TGX:16347-237**
Strap kit for -127 plug	**TGX:16347-238**
Adhesive	
1 lb epoxy	**A6X30004048**
Adapter	
Conduit adapter	**A6X30003981**
Tools	
Sensor Wrench	**TGX:16347-111**
Alignment Tool	**TGX:16347-137**
Documentation	
Manual	**FDK:521HAP0553**
Converter	
FUS880 converter kit for 2 track SYS	**7ME3440-0AA03-2DA4**

Note:
Installation spares kit include:

Concrete kit:
2 transducer mounting plugs, 2 straps, mounting hardware, epoxy, conduit adapter, installation guide

PVC kit:
2 transducer mounting saddles, mounting hardware, epoxy, conduit adapter, installation guide

PVC kit:
2 transducer mounting saddles, mounting hardware, epoxy, conduit adapter, installation guide

Accessories/Spare parts

Spare part

SITRANS FUS060 transmitter, available standard versions

Description	Version	Enclosure	Supply	Order No.	Symbol
FUS060, 230 V, HART, Metric	Transmitter for remote connection	IP65 (NEMA 4)	115 … 230 V AC 50/60 Hz	**7ME3050-2BA10-1BA1**	
FUS060, 230 V, HART, Imperial	Transmitter for remote connection	IP65 (NEMA 4)	115 … 230 V AC 50/60 Hz	**7ME3050-2BA10-1BA2**	
FUS060, 230 V, PROFIBUS, Metric	Transmitter for remote connection	IP65 (NEMA 4)	115 … 230 V AC 50/60 Hz	**7ME3050-2BA10-1DA1**	
FUS060, 230 V, PROFIBUS, Imperial	Transmitter for remote connection	IP65 (NEMA 4)	115 … 230 V AC 50/60 Hz	**7ME3050-2BA10-1DA2**	
FUS060, 24 V, HART, Metric	Transmitter for remote connection	IP65 (NEMA 4)	18 ... 30 V DC	**7ME3050-2BA20-1BA1**	
FUS060, 24 V, HART, Imperial	Transmitter for remote connection	IP65 (NEMA 4)	18 ... 30 V DC	**7ME3050-2BA20-1BA2**	
FUS060, 24 V, PROFIBUS, Metric	Transmitter for remote connection	IP65 (NEMA 4)	18 ... 30 V DC	**7ME3050-2BA20-1DA1**	
FUS060, 24 V, PROFIBUS, Imperial	Transmitter for remote connection	IP65 (NEMA 4)	18 ... 30 V DC	**7ME3050-2BA20-1DA2**	

SONO 3000 transmitter, available standard versions

Description	Version	Enclosure	Supply	Order No.	Symbol
SONO 3000 transmitter for compact and wall mounting	1 current output 1 frequency/pulse output 1 relay output	IP67 (NEMA 4X/6) Fibre glass reinforced polyamid	115 … 230 V AC 50/60 Hz	**7ME3150-1AA10-1AA0**	
			24 V AC/DC	**7ME3150-1AA20-1AA0**	
SONO 3000 transmitter for 19" rack and panel mounting	1 current output 1 frequency/pulse output 1 relay output	IP00	115/230 V AC 50/60 Hz	**7ME3150-2CA10-1AA0**	
	3 current outputs 2 frequency/pulse outputs 2 relay outputs	IP00	115/230 V AC 50/60 Hz	**7ME3150-2CC10-1AA0**	
			24 V AC/DC	**7ME3150-2CC20-1AA0**	
SONO 3000 transmitter 19" insert assembly complete with wall mounting enclosure	1 current output 1 frequency/pulse output 1 relay output	IP65 (NEMA 4) ABS plastic	115/230 V AC 50/60 Hz	**7ME3150-2EA10-1AA0**	
	3 current outputs 2 frequency/pulse outputs 2 relay outputs	IP65 (NEMA 4) ABS plastic	115/230 V AC 50/60 Hz	**7ME3150-2EC10-1AA0**	
			24 V AC/DC	**7ME3150-2EC20-1AA0**	
SONO 3000 transmitter Ex-d separate wall mounting, EEx de [ia/ib] IIC T5 ... T6, no ATEX approval, cable gland PG 13.5	1 current output 1 frequency/pulse output 1 relay output	IP65 (NEMA 4) AISI 316/Duplex	24 V AC/DC	**7ME3150-2FA22-1AA0**	

Accessories / Spare parts

Accessories/Spare parts

Accessories for SONO 3000 transmitter

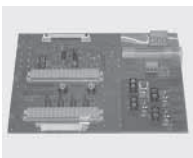
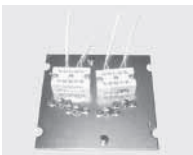
Description	Order No.	Symbol
Wall mounting kit for 7ME3150-1AA10-1AA0 and 7ME3150-1AA20-1AA0, using 4 x coaxial sensor cables, wall brackets, PG 13.5 cable glands.	**FDK- 085F5027**	

SENSORPROM memory unit for all transmitters

Description	Order No.	Symbol
SENSORPROM memory unit for SONOFLO When ordering: Inform on sensor Order No. and Serial No.	**FDK- 085B5329**	

4

Spare parts for SONO 3000 transmitter

Description	Order No.	Symbol
SONO 3000 EEx-d insert, no ATEX	**FDK- 085F5210**	
SONO 3000 19" back print for IP65 (NEMA 4) wall mounting 230 V version	**FDK- 085F5327**	
SONO 3000 assembly plate for coax connections	**FDK- 085L1023**	
SONO 3000 assembly base plate	**FDK- 085L1015**	
SONO 3000 EEx-d, front glas incl. frame	**FDK- 085U2109**	
SONO 3000 EEx-d, gaskets for transmitter housing	**FDK- 085U2002**	

Spare parts/accessories

Description	Order No.
SONO 3000 CT transmitter, IP67 (NEMA 4X/6) (incl. wall mounting kit) [1)2)]	**7ME3150-2AA10-1AC0**
SONO 3000 CT transmitter, IP65 (NEMA 4) [1)2)]	**7ME3150-2EA10-1AC0**
SONO 3000 CT transmitter, IP65 (NEMA 4), 24 V AC/DC [1)]	**7ME3150-2EA20-1AC0**
SONO 3000 CT transmitter, IP20 (NEMA 1) [2)]	**7ME3150-2DA10-1AC0**
Coax cable with transducer connection	
1 x 10 m (32.8 ft)	**FDK-085L2400**
1 x 20 m (65.6 ft)	**FDK-085L2401**
1 x 30 m (98.4 ft)	**FDK-085L2402**

[1)] All transmitters have 1 current output, 1 frq/pulse output and 1 relay each.

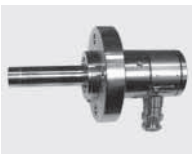
[2)] 115/230 V AC, 50 ... 60 Hz

Important:

Due to CT-requirements exchange of one of the above components requires new verification of the entire system at authorised laboratories.

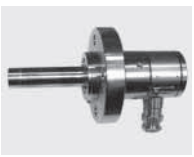
SONO 3100

SONO 3200 transducer complete unit with PG 13.5 cable glands

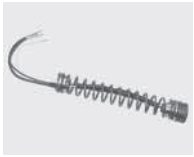
Transducer type	Material	Gasket	Pressure rating	Terminal housing	Approval	Temperature range [°C(°F)]	Length [mm (inch)]	Order No.	Symbol
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	50 (1.97)	**FDK-085B5306**	
O-ring	316 SS	O-ring [2]	PN 40	316 SS		-20 … +200 (-4 ... +392)	50 (1.97)	**FDK-085B5300**	
O-ring	316 SS	O-ring [2]	PN 40	316 SS	EExd [1]	-20 … +200 (-4 ... +392)	50 (1.97)	**FDK-085B5312**	
Flange	316 SS	Graphite	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	88 (3.47)	**FDK-085B5411**	
Flange	316 SS	Graphite	PN 40	316 SS		-20 … +200 (-4 ... +392)	88 (3.47)	**FDK-085B5321**	
Flange	316 SS	Graphite	PN 40	316 SS	EExd [1]	-20 … +200 (-4 ... +392)	88 (3.47)	**FDK-085B5425**	
Flange	316 SS	Graphite	PN 160	316 SS	EExd [1]	-20 … +200 (-4 ... +392)	88 (3.47)	**FDK-085B5432**	
Flange	316 SS	Aluminium	PN 40	316 SS		-200…+100 (-328 ... +212)	88 (3.47)	**FDK-085B5416**	

[1] No ATEX
[2] Chemical resistant O-ring

SONO 3200 transducer complete unit with M20 cable glands

Transducer type	Material	Gasket	Pressure rating	Terminal housing	Approval	Temperature range [°C (°F)]	Length [mm (inch)]	Order No.	Symbol
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	50 (1.97)	**FDK-085B5453**	
O-ring	316 SS	O-ring [4]	PN 40	316 SS		-20 … +200 (-4 ... +392)	50 (1.97)	**FDK-085B5450**	
O-ring	316 SS	O-ring [4]	PN 40	316 SS	EExd [2]	-20 … +200 (-4 ... +392)	50 (1.97)	**FDK-085B5451**	
Flange	316 SS	Graphite	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	88 (3.47)	**FDK-085B5461**	
Flange	316 SS	Graphite	PN 40	316 SS		-20 … +200 (-4 ... +392)	88 (3.47)	**FDK-085B5462**	
Flange	316 SS	Graphite	PN 40	316 SS	EExd [2]	-20 … +200 (-4 ... +392)	88 (3.47)	**FDK-085B5463**	
Flange	316 SS	Graphite	PN 160	316 SS	EExd [2]	-20 … +200 (-4 ... +392)	88 (3.47)	**FDK-085B5465**	
Flange	316 SS	Aluminium	PN 40	316 SS		-200…+100 (-328 ... +212)	88 (3.47)	**FDK-085B5471**	

SONO 3200 transducer insert

Temperature range [°C (°F)]	Length [mm (inch)]	Order No.	Symbol
-20…+200 (-4 ... +392)	50 (1.97)	**FDK-085B1411**	
-20…+200 (-4 ... +392)	88 (3.47)	**FDK-085B1459**	

Accessories / Spare parts

SONO 3200 transducer (Transducer body with insert)

Temperature range [°C (°F)]	Gasket	Pressure rating	Length [mm (inch)]	Order No.	Symbol
-20…+200 (-4 ... +392)	O-ring [4]	PN 40	50 (1.97)	**FDK-085B1405**	
-20…+200 (-4 ... +392)	Graphite	PN 40	88 (3.47)	**FDK-085B1464**	
-20 … +200 (-4 ... +392)	Graphite	PN 160	88 (3.47)	**FDK-085B5512**	

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SONOKIT

SONO 3200 transducer complete unit with PG13.5 cable glands

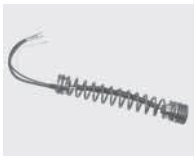
Trans-ducer type	Material	Gasket	Pressure rating	Terminal housing	Approval	Temperature range [°C (°F)]	Length [mm (inch)]	Order No.	Symbol
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	160 (6.3)	**FDK-085B5307**	
O-ring	316 SS	O-ring	PN 40	316 SS		-20 … +200 [3] (-4 ... +392)	160 (6.3)	**FDK-085B5301**	
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	230 (9.41)	**FDK-085B5308**	
O-ring	316 SS	O-ring [4]	PN 40	316 SS	EEx d [1]	-20 … +200 (-4 ... +392)	160 (6.3)	**FDK-085B5313**	
O-ring	316 SS	O-ring	PN 40	316 SS		-20 … +200 (-4 ... +392)	230 (9.41)	**FDK-085B5319**	

[1] No ATEX
[2] ATEX (Ex) IIC 2G EEx d IIC T3 ... T6
[3] 316 SS housing for -20 ... +200 °C (-4 ... +392 °F) but cable glands only for -20 ... +100 °C (-4 ... +212 °F)
[4] Chemical resistant O-ring

SONO 3200 transducer complete unit with M20 cable glands

Trans-ducer type	Material	Gasket	Pressure rating	Terminal housing	Approval	Temperature range [°C (°F)]	Length [mm (inch)]	Order No.	Symbol
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	160 (6.3)	**FDK-085B5454**	
O-ring	316 SS	O-ring	PN 40	316 SS		-20 … +200 [2] (-4 ... +392)	160 (6.3)	**FDK-085B5455**	
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 … +100 (-4 ... +212)	230 (9.41)	**FDK-085B5458**	
O-ring	316 SS	O-ring	PN 40	316 SS	EEx d [1]	-20 … +200 (-4 ... +392)	160 (6.3)	**FDK-085B5452**	
O-ring	316 SS	O-ring	PN 40	316 SS		-20 … +200 [2] (-4 ... +392)	230 (9.41)	**FDK-085B5459**	

SONO 3200 transducer insert

Temperature range [°C (°F)]	Length [mm (inch)]	Order No.	Symbol
-20 … +200 (-4 ... +392)	90 (3.54)	**FDK-085B1100**	
-20 … +200 (-4 ... +392)	160 (6.3)	**FDK-085B1419**	
-20 … +200 (-4 ... +392)	230 (9.41)	**FDK-085B1420**	

SONO 3200 transducer (Transducer body with insert)

Temperature range [°C (°F)]	Gasket	Length [mm (inch)]	Order No.	Symbol
-20 … +200 (-4 ... +392)	O-ring	90 (3.54)	**FDK-085B1101**	
-20 … +200 (-4 ... +392)	O-ring [3]	160 (6.3)	**FDK-085B1406**	
-20 … +200 (-4 ... +392)	O-ring	160 (6.3)	**FDK-085B5510**	
-20 … +200 (-4 ... +392)	O-ring	230 (9.41)	**FDK-085B5511**	

Terminal housing with PG 13.5 cable glands

Type	Order No.	Symbol
Material: PA 6.6, Temperature range: -20 … +100 °C (-4 ... +212 °F)	**FDK-085B1403**	
Material: AISI 316, Temperature range: -20 … +200 °C (-4 ... +392 °F)	**FDK-085B1402**	

Terminal housing with M20 cable glands

Type	Order No.	Symbol
Material: PA 6.6, Temperature range: -20 … +100 °C (-4 ... +212 °F)	**FDK-085B5501**	
Material: AISI 316, Temperature range: -20 … +200 °C (-4 ... +392 °F)	**FDK-085B5504**	
Material: AISI 316, Temperature range: -20 … +200 °C (-4 ... +392 °F) [1]	**FDK-085B5505**	

Transducer SONO 3200 gasket

Type	Pressure rating	Material	Temperature range [°C (°F)]	Order No.
Gasket O-ring (3 pcs. for complete transducer)	PN 40	FFKM[3]/FKM	-20…+200 (-4 ... +392)	**FDK-085B1089**
Gasket flange	PN 40/160	Graphite	-20…+200 (-4 ... +392)	**FDK-085B1080**
Gasket and 12 mm bolts and nuts for flange transducers	PN 40	Graphite, 316 SS	-20…+200 (-4 ... +392)	**FDK-085B1083**
Gasket and 16 mm bolts and nuts for flange transducers	PN 160	Graphite, 316 SS	-20…+200 (-4 ... +392)	**FDK-085B1084**
Gasket cryogenics	PN 40	Aluminium, O-ring	-200…+100 (-328 ... +212)	**FDK-633L0047**

[1] ATEX (Ex) IIC 2G EEx d IIC T3 ... T6

[2] 316 SS housing for -20 ... +200 °C (-4 ... +392 °F) but cable glands only for -20 ... +100 °C (-4 ... +212 °F)

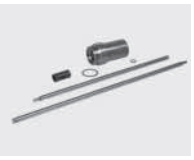
[3] Chemical resistant O-ring

Potting kit

Type/description	Order No.	Symbol
Potting kit, IP68, 10 m (289 ft) w.g. rating	**FDK- 085L2403**	

Accessories / Spare parts

Tools

Type/description	Order No.	Symbol
Extraction tool for replacement of SONO 3200 O-ring transducers under pressure (hot-tap) Transducer length:		
• 50 mm (1.97“)	**FDK- 085B5331**	
• 160 mm (6.3“)	**FDK- 085B5333**	
• 230 mm (9.1“)	**FDK- 085B5335**	
Angle measurement tool for SONOKIT	**FDK-085B5330**	
Hot-tap drilling tool for SONOKIT	**FDK-085B5392**	
Alignment tool for SONOKIT	**FDK-085B5393**	

Cables

Type/description	Order No.	Symbol
Standard 75 Ω coax cable, T_{max} = 75 °C		
• 15 m (49.2 ft)	**FDK- 085B1373**	
• 30 m (98.4 ft)	**FDK- 085B1374**	
• 60 m (196.8 ft)	**FDK- 085B1375**	
• 100 m (328 ft)	**FDK- 085B1376**	
Teflon 75 Ω coax cable, T_{max} = 200 °C (392 °F)		
• 5 m (16.4 ft)	**FDK- 085B1378**	
• 15 m (49.2 ft)	**FDK- 085B1379**	

Transducer holder for SONOKIT

Type/description	Order No.	Symbol
1-track		
• 230 mm (9.1“) for concrete pipe 60°, DN 600 … DN 4000 (24“ ... 160“)	**FDK-085L1656**	
• 160 mm (6.3“) stainless steel 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1105**	
• 160 mm (6.3“) carbon steel 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1104**	
2-track		
• 230 mm (9.1“) for concrete pipe 60°, DN 600 … DN 4000 (24“ ... 160“)	**FDK-085L1111**	
• 160 mm (6.3“) stainless steel 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1109**	
• 160 mm (6.3“) carbon steel 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1108**	

The part which is welded onto the pipe is either stainless steel or carbon steel.

Mounting plate for SONOKIT

Type/description	Order No.
1-track	
• 160 mm (6.3“), stainless steel, 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1115**
• 160 mm (6.3“), carbon steel, 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1114**
2-track	
• 160 mm (6.3“), stainless steel, 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1119**
• 160 mm (6.3“), carbon steel, 60°, DN 300 … DN 4000 (12“ ... 160“)	**FDK-085L1118**

The mounting plates are either completely in stainless steel or carbon steel.

Cable connection boxes

Type/description	Order No.	Symbol
Junction box for coax cable		
• IP68 metal box for 2 coax cables	**FDK- 085B1360**	
• IP68 metal box for 4 coax cables	**FDK- 085B1361**	
• IP68 EEx-e plastic box for 2 coax cables, no ATEX approval	**FDK- 085B1362**	
• IP68 EEx-e plastic box for 4 coax cables, no ATEX approval	**FDK- 085B1363**	

Cable glands

Type	Material	Temperature range [°C (°F)]	Approval	Order No.
PG 13.5	Chrome plated brass	-20 ... +100 (-4 .... +212)		**FDK-085B1381**
PG 13.5	Stainless steel	-20 ... +200 (-4 .... +392)		**FDK-085B1385**
PG 13.5	Stainless steel	-20 ... +200 (-4 .... +392)	Ex d[2]	**FDK-085B1387**
M20	Plastic	-40 ... +100 (-40 .... +212)		**FDK-085B1317**
M20	Chrome plated brass	-20 ... +100 (-4 .... +212)		**FDK-085B1394**
M20	Stainless steel	-20 ... +200 (-4 .... +392)		**FDK-085B1399**
M20	Stainless steel	-20 ... +200 (-4 .... +392)	Ex d[1]	**FDK-085B1315**

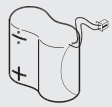
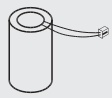
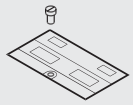
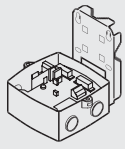
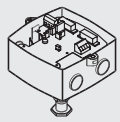
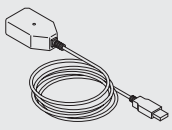
[1] ATEX approved
[2] No ATEX

Calculator SITRANS FUE950

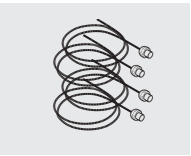
Type/description	Order No.
Accessories for calculator	
Data/pulse input module	**FDK-087H0111**
Data/pulse output module	**FDK-087H0110**
M-bus slave module/input module	**FDK-087H0109**
Infrared optical head for data acquisition	**FDK-087H0108**
Brackett for SITRANS FUE950 wall mounting (12 pcs)	**FDK-087H0117**
Cable for data aquisition PC/D-sub 9F/3 wire	**FDK-087H0121**
Verification equipment for calculator	**FDK-087H0122**
3.6 V DC-cell for SITRANS FUE950	**FDK-087H0113**
230 V AC supply module for SITRANS FUE950	**FDK-087H0114**
24 V AC supply module for SITRANS FUE950	**FDK-087H0115**
3.0 V battery CR 2032 for SITRANS FUE950 (10 pcs.)	**FDK-087H0116**
Re-programming tool (complete set)	**FDK-087H0134**
Pocket for temperature sensor Pt500 (2 pcs.)	
Brass pocket G½B x 40 mm (PN 16)	**FDK-087H0104**
Brass pocket G½B x 85 mm (PN 16)	**FDK-087H0105**
Brass pocket G½B x 120 mm (PN 16)	**FDK-087H0106**
Stainless steel pocket G½B x 85 mm (PN 25)	**FDK-087H0100**
Stainless steel pocket G½B x 120 mm (PN 25)	**FDK-087H0101**
Stainless steel pocket G½B x 155 mm (PN 25)	**FDK-087H0102**
Stainless steel pocket G½B x 210 mm (PN 25)	**FDK-087H0103**

Please also see www.siemens.com/SITRANSFordering
fo practical examples of ordering.

SITRANS FUS380/FUE380 - Spare parts

Type/description	Order No.	Symbol
Dual battery pack (6 year life-time) 33 Ah	**FDK-087H2255**	
Single battery back-up to main supply 13.5 Ah	**FDK-087L4201**	
Battery cover	**A5E00694468**	
PG 13.5 set (2 pcs.) for main cable/pulse cable	**FDK-083G0228**	
PG 13.5 set (2 pcs.) for dual coax cable (6 mm)	**A5E00694500**	
Wall mounting kit for remote mounting including printed circuit board (DN 100 ... 800 (4" ... 32") only)	**A5E00694509**	
Terminal box for compact mounting including printed circuit board	**A5E00694660**	
Brace (holder) for optical Irda eye	**A5E00695277**	
Irda infrared interface adapter with USB connector	**FDK-087L4163**	
RS 232 add-on module, point to point communication interface with MODBUS RTU protocol	**FDK-087L4212**	
RS 485 add-on module, multi-drop communication interface with MODBUS RTU protocol	**FDK-087L4213**	

Accessories / Spare parts

Type/description	Order No.	Symbol
Cable set (4 pcs.) for remote mounting 5 m (16.4 ft)	**A5E00695476**	
Cable set (4 pcs.) for remote mounting 10 m (32.8 ft)	**A5E00695479**	
Cable set (4 pcs.) for remote mounting 20 m (65.6 ft)	**A5E00695480**	
Cable set (4 pcs.) for remote mounting 30 m (98.4 ft)	**A5E00695483**	
Cable set (4 pcs.) for compact version 1 m (3.28 ft)	**A5E00695486**	
Process Device Manager SIMATIC PDM		
SIMATIC PDM Single Point V6.0 For operation and parameterization of one field devide, communication using PROFIBUS DP/PA or HART modem, incl. 1 TAG **Cannot** be expanded by further functions or TAG option/power-pack 5 languages (German, English, French, Spanish, Italian) executes with Windows 2000 Professional or Windows XP Professional	**6ES7 658-3HX06-0YA5**	

Downloads for DEVICE description FUE380
http:/support.automation.siemens.com/WW/view/en/17320235

SITRANS FUS060/SONO 3100

Type/description	Order No.
Electronics cover with glass plate	**7ME5933-0AC01**
Cover for sensor cable + gasket	**7ME5933-0AC02**
Cover for mains supply/communication	**7ME5933-0AC03**
Mounting plate for wall mounting	**7ME5933-0AC04**
Safety clamp for 7ME5933-0AC01	**7ME5933-0AC06**
Transducer cable - standard 2 x 15 m (49 ft)	**A5E00861432**
Transducer cable - high temperature 2 x 5 m (16.4 ft)	**A5E00861438**
Transducer cable - high temperature 2 x 15 m (49 ft)	**A5E00861435**

Overview

SITRANS F US clamp-on ultrasonic flowmeters provide highly accurate measurement while minimizing installation time and maintenance expense.

Benefits

- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to foul or wear
- No pressure drop or energy loss
- Wide turn-down ratio
- Choice of single, dual or multiple channel versions and a variety of enclosures - to suit your operating conditions and requirements

Application

SITRANS F US clamp-on ultrasonic flowmeters have six product families, each targeting specific applications:

FUS1010 and FUP1010 General purpose flowmeters are suitable for a wide variety of liquid applications, including the following:

- Water industry
  Raw water
  Potable water
  Sludges
  Chemicals
- Wastewater industry
  Raw sewage
  Effluent
  Sludges
  Mixed liquor
  Chemicals
- HVAC industry
  Chillers
  Condensers
  Hot & cold water systems
- Power industry
  Nuclear
  Fossil
  Hydroelectric
- Processing industry
  Process control
  Batching
  Rate indication
  Volumetric and mass measurement

FUE1010 Energy flowmeters are ideally suited to thermal energy / power industry applications, including:

- Chilled water sub-metering
- Hot water sub-metering
- Condenser water
- Glycol
- Thermal storage
- Lake source cooling

FUH1010 Oil flowmeters are ideal for applications carrying crude oil, refined petroleum or liquefied gas. There are three application areas: Interface detectors, volumetric flowmeters and mass or standard volume flowmeters

Interface detectors / density meters

- Precise identification of interfaces on multi-liquid pipelines
- Rapid and precise scraper "pig" indication
- Product identification
- Density indication

Viscosity compensated volumetric flowmeters

- Applications with multiple liquids having a wide viscosity range
- Automatic gross volume compensation due to viscosity changes

Standard volume (net) mass flowmeters

- Standard (net) volume flow measurement
- Suitable for use in leak detection systems
- Mass flow output measurement
- Interface detection
- Scraper („pig“) detection
- Chemical and petrochemical processing

FUG1010 Gas flowmeters are ideal for most natural and process gas industry applications, including:

- Checkmetering
- Allocation
- Flow survey verification
- Lost and unaccounted for (LAUF) analysis
- Production
- Storage

FUS1020 General purpose flowmeters are suitable for most clean liquid applications, including the following:

- Water & wastewater industry
  Potable water
  Wastewater, influent & effluent
  Processed sewage, sludge
- Chemical feed industry
  Sodium hypochlorite
  Sodium hydroxide
- HVAC & power industries
  Coolant flow
  Fuel flow
- Process control
  Chemicals
  Pharmaceuticals

Clamp-on ultrasonic flowmeters
System information and selection guide

System information and selection guide

SITRANS F US Clamp-on meters	FUS1010 (Standard)	FUS1020 (Basic)	FUP1010 (Portable)	FUE1010 (Energy)	FUH1010 (Oil)	FUG1010 (Gas)
Application - Fluid type						
Water and aqueous solutions	X	X	X			
Utility district heating, cooling	X		X	X		
Chemical	X[4]	X[4]	X[4]			
Hydrocarbons/Petrochemical, multiple products or varying viscosity, liquefied gases, net and gross volume					X	
Hydrocarbons (Single product with limited viscosity range) gross volume	X				X	
Very low flow (<10 lpm) in small pipes	X[4]	X[4]	X[4]			
Natural gas						X
Process gas						X
Slurries or liquids with high percentage of undissolved gases	X		X			
High temperature liquids > 120 °C (248 °F)	X[1]	X[1]	X[1]	X[1]	X[1]	
Aerospace or hydraulic test	X[2]		X[2]			
Refrigeration liquids	X	X	X	X		
Food products	X	X	X			
Flare gas						X[3]
Unique features						
Field clamp-on (non-intrusive)	X	X	X	X	X	X
Doppler (Reflexor) hybrid capability	X		X	X		
Wall thickness gauge (accessory)			X	X[5]		
Standard volume or mass flow; per API 2540					X	
Interface detection					X	
Density output					X	
Standard volume or mass flow; per AGA 8						X
Mass flow capability (UniMass)	X		X			
Differential temperature w/ energy calculation				X		
Temperature measurement	X		X	X	X	X
Analog input	X		X	X	X	X
Large graphics display (optional)	X		X	X	X	X
Diagnostic PC software (DataView)	X	X	X	X	X	X
Number of acoustic beams and channels						
1-channel	X	X	X	X	X	X
2-path	X	X	X	X	X	X
2-channel w/ arithmetic function	X	X	X	X		
4-path / (special order)	X				X	X
4-channel w/ sum of active channels	X					
Enclosure ratings						
IP65 (NEMA 4)		X				
IP65 (NEMA 4X)	X			X	X	X
IP67 (NEMA 6)			X			
IP40 (NEMA 12)			X	X		
IP65 (NEMA 7) Compact	X				X	X
IP66 (NEMA 7) Wall mount	X				X	X

[1] Special order high temperature clamp-on transducer
[2] Special order Aerospace clip-on transducer recommended
[3] Special order insertion style gas transducer required
[4] May require special order FlowTube in-line transducer for very low flow rates
[5] Available with portable energy systems

SITRANS F US Clamp-on meters	FUS1010 (Standard)	FUS1020 (Basic)	FUP1010 (Portable)	FUE1010 (Energy)	FUH1010 (Oil)	FUG1010 (Gas)
Agency approvals						
FM / CSA CLASS 1 DIV 1	X			X	X	X
ATEX	X				X	X
UL / ULc		X	X			
Standard pipe outer diameter range (larger sizes are available as special order)						
6.5 ... 1220 mm (0.25“ ... 48“)	X	X	X			
38 ... 1220 mm (1.5“ ... 48“)				X	X	X
Power Supply						
Internal battery operation			X	X[1)]		
Battery charger (90 ... 240 V AC 50 ... 60 Hz) with country specific line cord			X	X[1)]		
90 ... 240 V AC, 50 ... 60 Hz	X	X		X	X	X
9 ... 36 V DC	X	X		X	X	X

[1)] Available with portable energy systems

4

Transducer type selection guide

	Standard transducers supported in MLFB			
Application condition. Note all that apply before making selection	Standard clamp-on **High precision**	Standard clamp-on **Universal**	Standard Doppler **(Reflexor)**	Notes
Media				
General survey (clean liquids) on steel and non-steel pipes		X	O	
General survey (clean liquids) on a limited range of steel pipes	X		O	
Moderately aerated liquid or slurry	X			
Highly aerated liquid or slurry	O	O	X	High temperature Doppler transducers also available as special order
Permanent installation on steel pipe (clean liquids)	X		O	
Installation in offshore or corrosive environment	O	O	O	Transducers available with corrosion resistance as special order
Very low flow rates in pipes less than DN 25 (1“). See accuracy graph	O	O	O	Flow tubes available as special order
Liquid temperature greater than 120 °C (248 °F)	O	O	O	High temp metal block transducers available as special order (to 230 °C (446 °F))
Operation on single pipeline flowing multiple products	X	O		
Natural gas or process gas	X	O	O	Consult sales specialist for all gas applications
Pipe material				
Steel pipe with liquid temperature > 60 °C (140 °F)	O	X		Special order high precision transducers can be request for temps > 60 °C but < 120 °C (248 °F)
Steel	X		O	
Steel pipe with diameter/wall thickness ratio <10	O	X		
Non-steel pipe material (copper, ductile Iron, cast iron, etc.)	O	X		High precision transducers can also be used on plastic and aluminum pipes
Wall thickness > 25.4 mm (1“)	O	X		

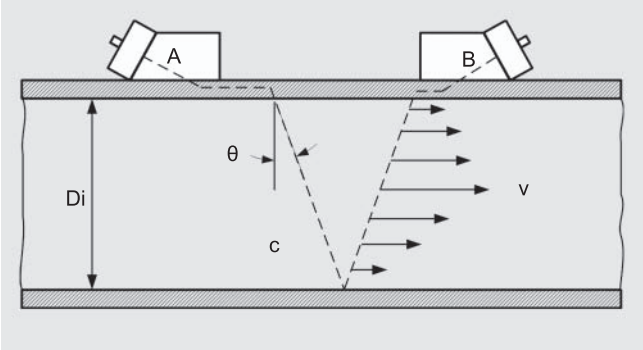
O = not suitable X = preferred choice

Clamp-on ultrasonic flowmeters
System information and selection guide

Function

Operating Principle

The SITRANS FUS1010 system is a transit-time ultrasonic meter that provides exceptional performance using a non-invasive clamp-on approach. Ultrasonic transducers transmit and receive acoustic signals directly though the existing pipe wall, where the fluid refraction angle is governed by Snell's law of refraction.



Clamp-on transducer mounted in a reflect configuration

The beam refraction angle is calculated as follows:

$\sin\theta = c / V_\phi$

c = Velocity of sound in fluid

V_φ = Phase velocity (a constant in the pipe wall)

The flowmeter automatically compensates for any change in fluid sound velocity (or beam angle) in response to variations in the average transit-time between transducers A and B. By subtracting the computed fixed times (within the transducers and pipe wall) from the measured average transit-time, the meter can then infer the required transit-time in the fluid (T_{Fluid}).

The Sound waves traveling in the same direction as flow ($T_{A,B}$) arrive earlier than sound waves traveling against the direction of flow ($T_{B,A}$). This time difference (Δt) is used to compute the line integrated flow velocity (v) as shown in the equation below:

$v = V_\varphi / 2 \cdot \Delta t / T_{Fluid}$

Once the raw flow velocity is determined, the fluid Reynolds number (Re) must be determined to properly correct for fully developed flow profile. This requires the entry of the fluid's kinematic viscosity (visc) as shown in the equations below, where Q represents the final flow profile compensated volumetric flow rate.

$Re = Di \cdot v / visc \cdot Q = K(Re) \cdot (\pi / 4 \cdot Di^2) \cdot v$

v = Flow velocity

$visc = \mu / \rho$ = (dynamic viscosity / density)

K(Re) = Reynold flow profile compensation

In all wetted type ultrasonic flowmeters the meter constants are configured prior to leaving the factory. As this is not possible with clamp-on meters, the settings must be made by the customer at the time of installation. These settings include pipe diameter, wall thickness, liquid viscosity, etc.

SITRANS Clamp-On meters that include temperature sensing can be configured to dynamically infer changes in fluid viscosity for the purpose of computing the most accurate flow profile compensation (K_{Re}).

Ultrasonic Transducer Types

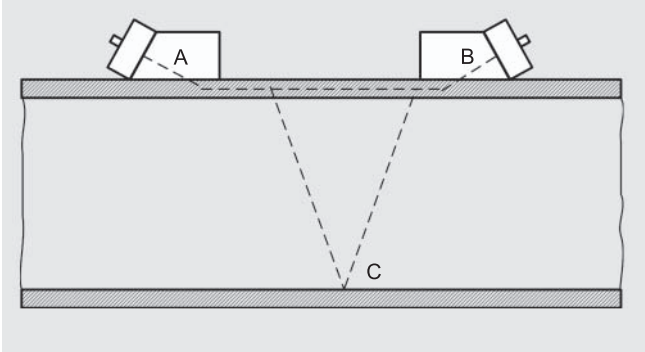
Two basic types of Clamp-On transducers can be selected for use with the SITRANS FUS1010 flowmeter. The lower cost "universal" transducer is the most common type in the industry and is suitable for most single liquid application where the sound velocity does not vary much. This transducer type can be used on any sonically conductive pipe material (including steel) making it well suited for portable survey applications. Universal transducers are selected based on the pipe diameter range alone, so wall thickness is not important to the selection process.

The second transducer type is the patented WideBeam transducer (called high precision), which utilizes the pipe wall as a kind of loudspeaker to optimize the signal to noise ratio and provide a wider area of vibration. This makes this kind of transducer less sensitive to any change in the fluid medium.

The WideBeam transducer is designed for steel pipes, but can also be used with aluminum, titanium and plastic pipe. It is the preferred transducer for HPI and gas applications. Note that unlike the universal type, this transducer selection is dependent only on the pipe's wall thickness.

Automatic Zero Drift Correction (ZeroMatic Path™)

When WideBeam transducers are installed in the "Reflect" mode configuration shown below, the acoustic signal travels in two different paths between transducers A and B. One path "ACB" travels through the pipe wall and fluid, while the other path "AB" never enters the fluid medium.

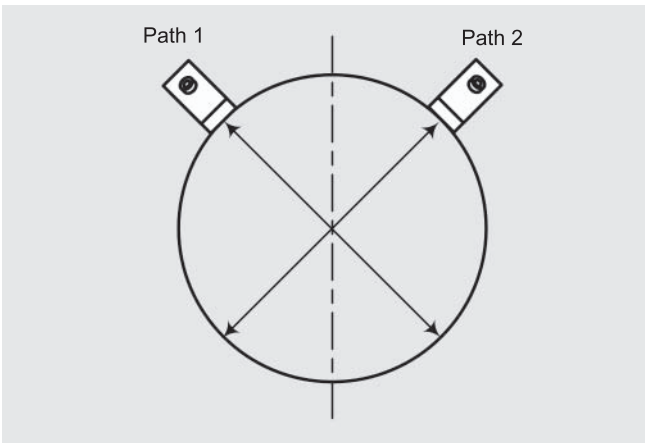


This later path provides the meter with a reference signal that is completely independent of flow rate and can therefore be used as a measure of transducer "mis-match". By continually analyzing this pipe wall signal the FUS1010 meter can dynamically correct for flow errors caused by zero drift.

Multi-Channel Flowmeters

For improved flow profile averaging, redundancy, or better cost per measurement, Clamp-On meters can be supplied with 1 or 2 measurement channel, with 4 channel meters supplied as special order.

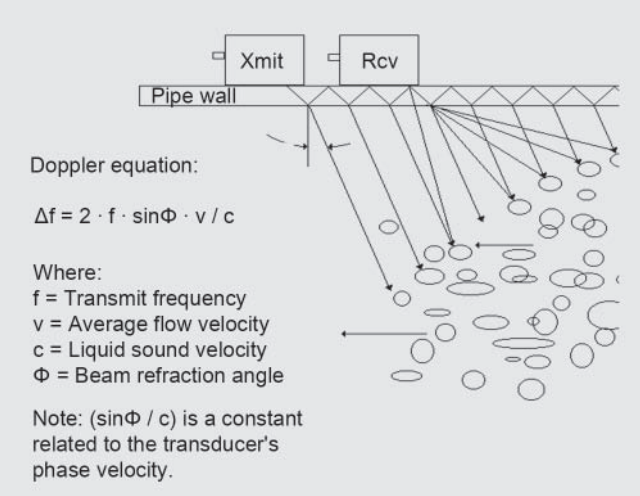
In the standard FUS, FUP, FUE systems, these channels can be installed on separate independent lines or in a multi-beam installation as shown below. This choice is made during meter setup, where either a multi-beam (two beams on same pipe) or multi-channel installation can be selected.



Dual Beam installation example

Doppler (Reflexor®) Operation

The Doppler measurement technique relies on the reflection of sound energy off tiny gas bubbles or suspended particles to create a doppler shift in the fixed frequency acoustic transmit signal, as shown below.


Xmit
Rcv
Pipe wall
Doppler equation:
Δf = 2 · f · sinΦ · v / c
Where:
f = Transmit frequency
v = Average flow velocity
c = Liquid sound velocity
Φ = Beam refraction angle
Note: (sinΦ / c) is a constant related to the transducer's phase velocity.

When de-demodulated using FFT signal processing, this doppler shifted frequency (Δf) can be used to measure the flow rate as described in the associated doppler equations below.

Although the standard transit-time measurement system is very tolerant of high levels of liquid aeration and high solids content, there will be cases where insufficient signal will be available for operation with transit-time mode. For these cases the FUS, FUP and FUE meters can be ordered with this optional doppler capability, which requires an additional doppler transducer.

SITRANS meter family description

SITRANS FUS1010 flowmeters

The FUS1010 system is a basic function permanent (or dedicated) clamp-on meter that is available with a full range of safety approvals, I/Os and enclosure types. This meter can be used in a wide range of applications but does not include the special functions found in the hydrocarbon FUH and energy FUE flowmeters.

The FUS1010 meter is typically programmed with a fixed viscosity and specific gravity entry, which can limit the mass flow and volumetric flow accuracy when highly variable (multi-product) liquid properties flow through the same pipeline.

If this meter is ordered with the Type 3 hardware and program configuration, it will have the ability to accommodate clamp-on RTDs, or an analog input from a temperature transmitter. With an active measurement of liquid temperature the meter can then be programmed to compensate for changes in liquid density and viscosity by mean of a “UniMass” table (for advanced users).

SITRANS FUS1020 flowmeters

The FUS1020 system has the same basic function of the FUS1010 system, but does not include the same I/O capability or safety approval rating of the FUS1010. This basic meter is intended for single liquid applications that do not require these additional features.

SITRANS FUP1010 Portable meters

The FUP1010 meter has all the capabilities of the FUS1010 meter, but in a battery powered portable configuration. This meter is ideal for general flow survey work where high accuracy is required. Note that the FUP meter is not available with hazardous areas approvals.

SITRANS FUE1010 Energy meters

By combining clamp-on transit-time flow measurement with accurate temperature differential measurement, the FUE1010 system provides a solution to thermal energy metering with no interruption of service. Energy measurement can be provided for water, ethylene glycol and brine solutions or steam condensate.

Absolute and differential temperature measurement is accomplished with the use of 2 matched 1 kΩ RTD elements installed on the supply and return side of the heating or cooling system. Efficiency calculation (kW/ton, EER or COP) is also available in systems with the optional analog input capability, which allow the meter to accept a power meter output.

The FUE1010 system is available in both dedicated (IP65 (NEMA 4X)) and portable configurations.

SITRANS FUG1010 Gas meters

This unique Clamp-On gas meter uses the same WideBeam transit-time operating principle described above. However, due to the very low density and sound velocity characteristics of gases, this meter requires a high gain signal amplifier and the installation of a pipe damping material.

The pipe damping material consists of an adhesive backed viscoelastic film that is designed to attenuate any stray acoustic transmit energy that may otherwise interfere with the transit-time gas signal. Damping material installation requires a clean (grease free) pipe surface with well bonded paint.

The Clamp-On gas meter is capable of operation on most gases (natural gas, oxygen, nitrogen, carbon monoxide, etc) with a typical minimum operating pressure of 10 barg (145 psig). Low molecular weight gases such as helium or hydrogen can also be measured, but at a higher minimum pressure. **Be sure to contact a Siemens clamp-on specialist before placing a gas system order.**

Standard volume computation: The FUG1010 gas meter is not designed with the same capabilities of a volume compensating flow computer but it can provide a standard volume or mass flow output for fixed gas compositions. All FUG1010 Gas meters include analog input capability that can be used for pressure and temperature compensation. With the installation of an AGA8 lookup table this meter can dynamically adjust the compressibility factor (Z_{act}) in response to changes in gas pressure and temperature, as indicate below:

Std. Rate = $Q_{act} * P_{act}/P_{base} * T_{base}/T_{act} * Z_{base}/Z_{act}$

SITRANS FUH1010 Hydrocarbon meters

There are two models of flowmeters included in the 1010FUH family, a viscosity compensated model, used for applications that will flow a wide range of viscosity, and a standard volume (Mass) model. Both models rely on a variable referred to as “liquident”, which is used to infer the liquid’s viscosity and optionally the liquid’s density. This variable represents the measured liquid sonic velocity compensated by the operating temperature and pressure, so for a given liquid product the measured liquident output will remain constant over a wide range of pressure or temperature.

PV (Viscosity Compensation) Option:

This is the lower cost FUH meter option that uses the liquident variable to infer only the actual liquid viscosity. This meter does NOT provide the standard volume, mass flow, liquid identification or density output available in the DV meter option described below. The PV meter is suitable for any petroleum application where actual volume required as the input to an external RTU or flow computer.

Clamp-on ultrasonic flowmeters
System information and selection guide

DV (Standard Volume) Option:

This Liquident variable can also be used to identify the liquid's name (gasoline, fuel oil, crude oil, etc) as well as it's physical properties (specify gravity, API, viscosity and compressibility) at base conditions. With this information the meter can be configured to output a temperature and pressure compensated (Standard) volume flow rate using the API 2540 and API MPMS chapter 11.2.1 methods as shown below.

Correction for Temperature:

Compute Thermal Expansion Coefficient (α_b):

$\alpha_b = KO / \rho_b^2 + K1 / \rho_b$

where: KO and K1 are constants dependent on type of liquid and ρb is the liquid density at base conditions

Compute temperature correction factor (K_T):

$K_T = \rho_b * EXP (- \alpha_b \Delta T (1 + 0.8 \alpha_b \Delta T))$

where: $\Delta T = (T - \text{base temperature})$

Correction for Pressure:

Compute Compressibility Factor (F):

$F = EXP(A + B T + (C + D T) / \rho_b^2$

where: A, B, C and D are constants, and "T" is liquid temperature

Compute pressure correction factor (K_p):

$K_p = 1 / (1 - F (P_{act} - P_{base}) * 10^{-4})$

Final Volume Correction: $Q_{std} = Q_{act} * K_t * K_p$

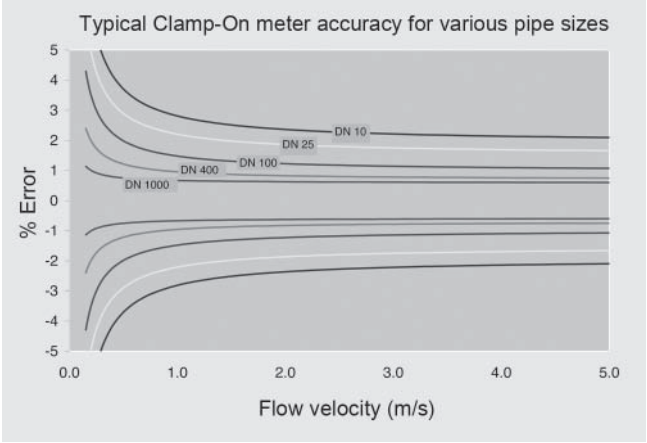
Available outputs from this meter include: API, Density, Mass Flowrate, Standard Volume Flowrate and Liquid Identification.

B (Interface Detection) Option:

This meter option is designed to provide all the Non-Flow capabilities of a DV meter, making it an ideal non-intrusive alternative to a densitometer, interface detector or pig detector. Be aware that this meter does NOT measure flow rate.

General Installation Guidelines for transit-time Clamp-On Transducers

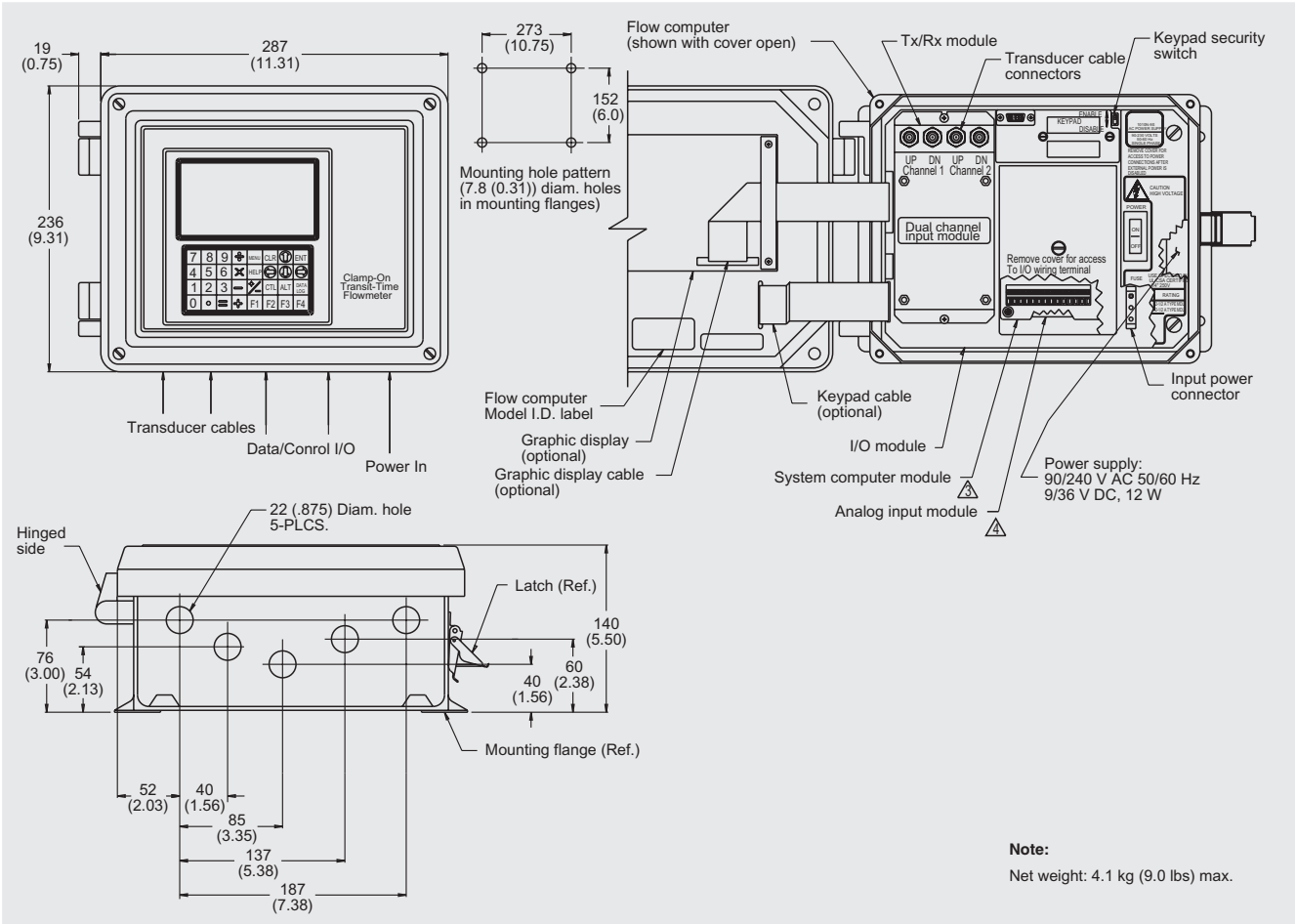
- Minimum measuring range: 0 to ± 0.3 m/s velocity (see meter accuracy graph below for more detail)
- Maximum measuring range: 0 to ± 12 m/s (± 30 m/s for high precision transducers). Final flow range determination requires application review
- For very low flow rates on small diameter lines (< DN 25 or 1 inch) a special order inline FlowTube may be recommended. Consult sales specialist for details



- Pipe must be completely full within the transducer installation volume for accurate flow measurement!
- Typical MINIMUM straight pipe requirements are: 10 Diameters upstream / 5 Diameters downstream. Additional straight run is required for double out-of-plane elbows and partially open valves. A minimum of 20 upstream diameters is recommended for clamp-on gas systems
- Transducers should be installed at least 20° off vertical for horizontal pipes. This reduces the chance of beam interference from gas buildup at the top of the pipe
- Operation inside the Reynolds transition region, between 1000 < Re < 5000 should be avoided for best accuracy
- Submersible and direct burial installations can be accommodated. Consult sales representative for details
- Ultrasonic coupling compound is provided with all transducer orders. Insure that a permanent coupling compound is used for long term installations
- Refer to the "Transducer type selection guide" to insure proper application of the equipment

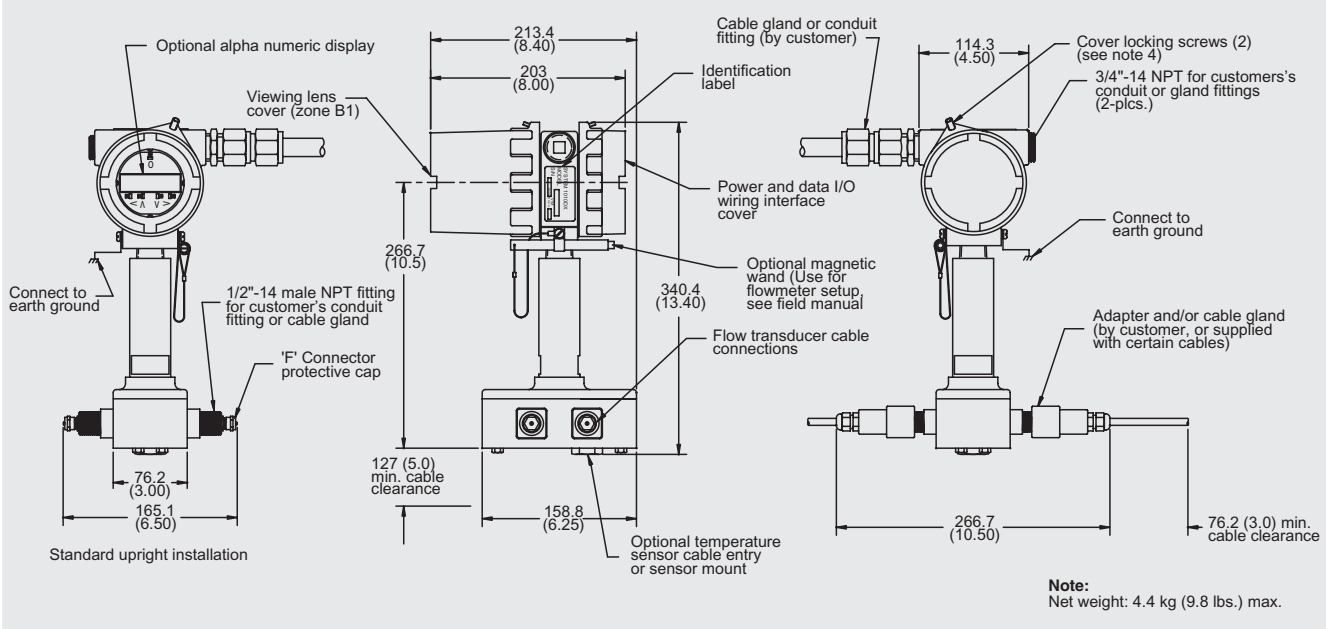
Dimensional drawings

FUS1010, FUH1010 and FUG1010 IP65 (NEMA 4X) Enclosure



Note:
Net weight: 4.1 kg (9.0 lbs) max.

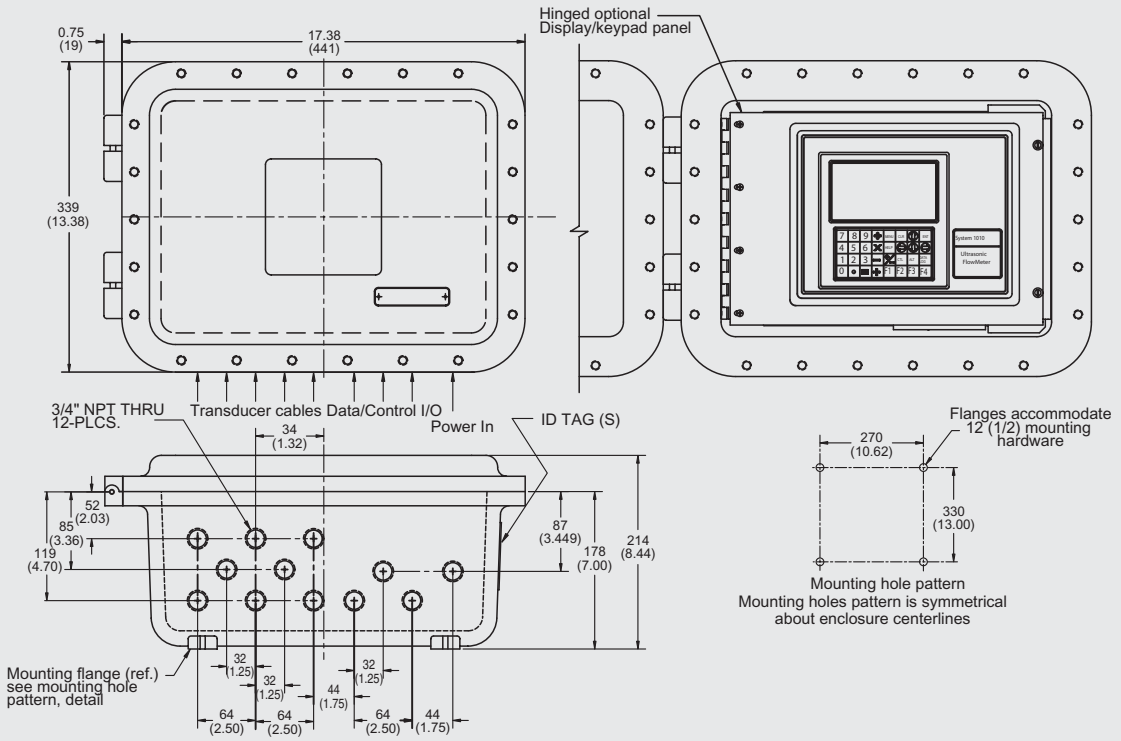
FUS1010, FUH1010 and FUG1010 IP65 (NEMA 7) Compact explosion proof enclosure

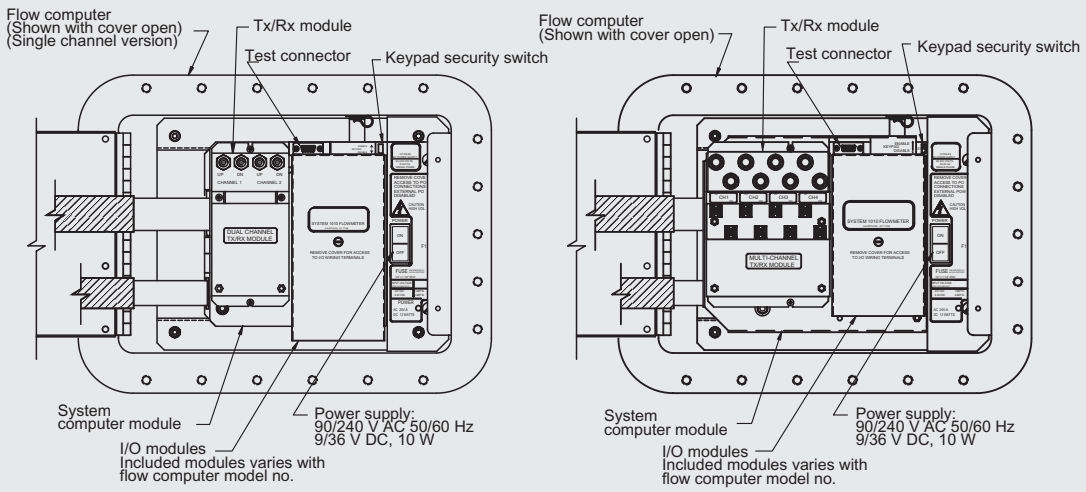

Optional alpha numeric display
Viewing lens cover (zone B1)
Connect to earth ground
1/2"-14 male NPT fitting for customer's conduit fitting or cable gland
'F' Connector protective cap
76.2 (3.00)
165.1 (6.50)
Standard upright installation
213.4 (8.40)
203 (8.00)
Cable gland or conduit fitting (by customer)
Identification label
Power and data I/O wiring interface cover
266.7 (10.5)
Optional magnetic wand (Use for flowmeter setup, see field manual
340.4 (13.40)
Flow transducer cable connections
127 (5.0) min. cable clearance
158.8 (6.25)
Optional temperature sensor cable entry or sensor mount
114.3 (4.50)
Cover locking screws (2) (see note 4)
3/4"-14 NPT for customers's conduit or gland fittings (2-plcs.)
Connect to earth ground
Adapter and/or cable gland (by customer, or supplied with certain cables)
266.7 (10.50)
76.2 (3.0) min. cable clearance

Note:
Net weight: 4.4 kg (9.8 lbs.) max.

Clamp-on ultrasonic flowmeters
System information and selection guide

FUS1010, FUH1010 and FUG1010 IP66 (NEMA 7) Wall mount explosion proof enclosure





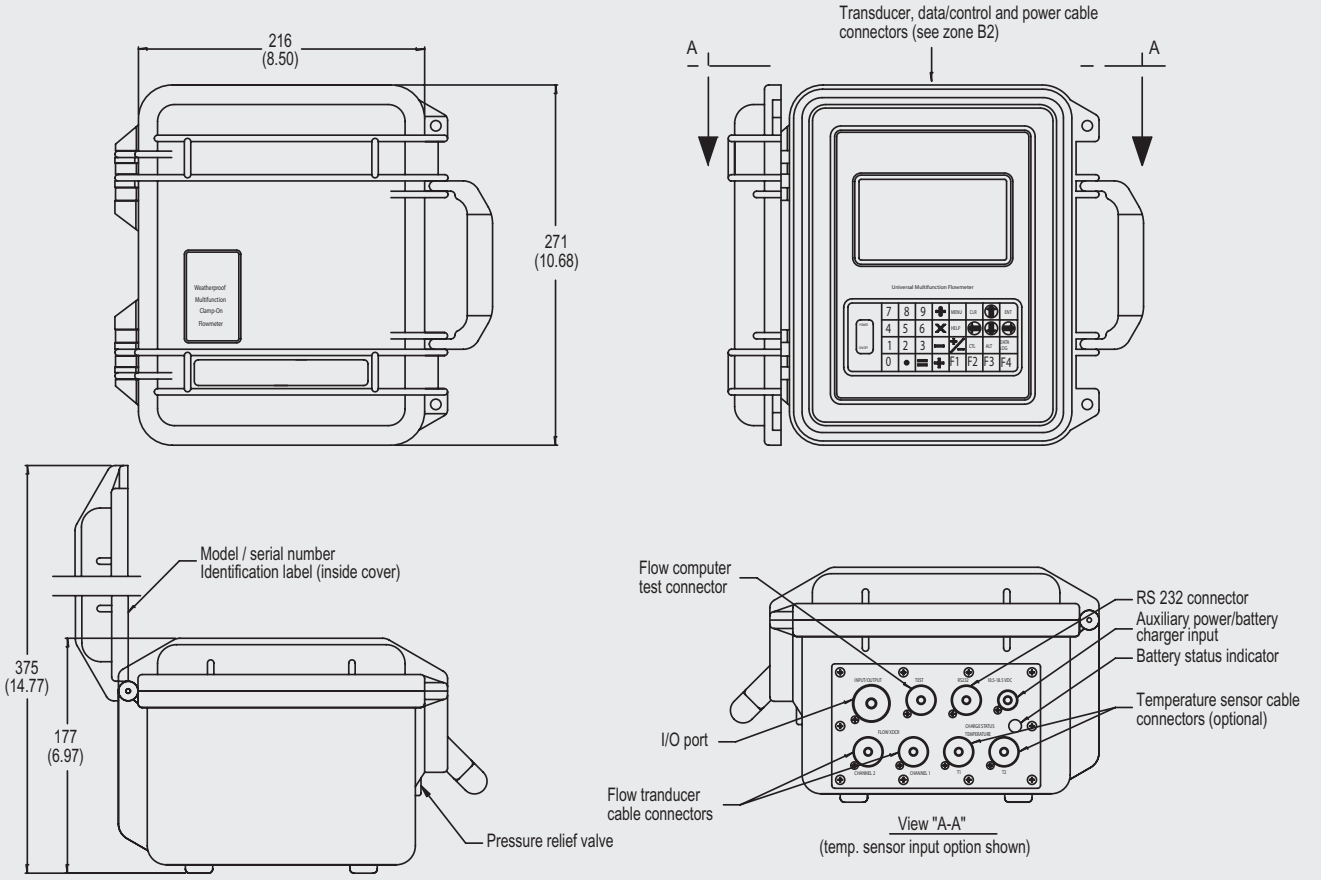
Single / Dual channel flowmeter

Multi-channel flowmeter

Note:

Net weight: 29 kg (64.0 lbs) max.

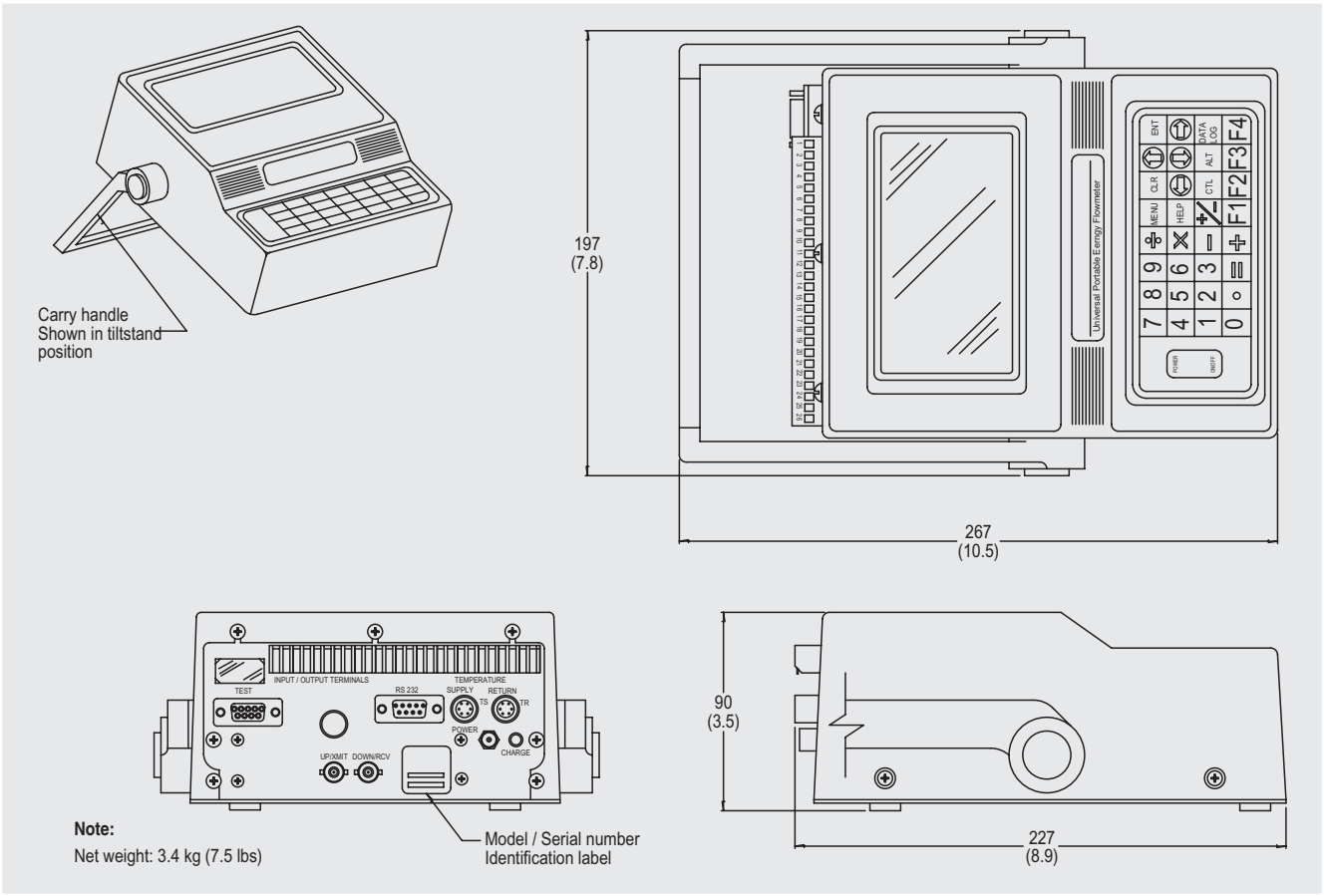
FUP1010 IP67/63 (NEMA 6/3R) Weatherproof impact resistant enclosure



Note:
Net weight: 3.64 kg (8.0 lbs.)

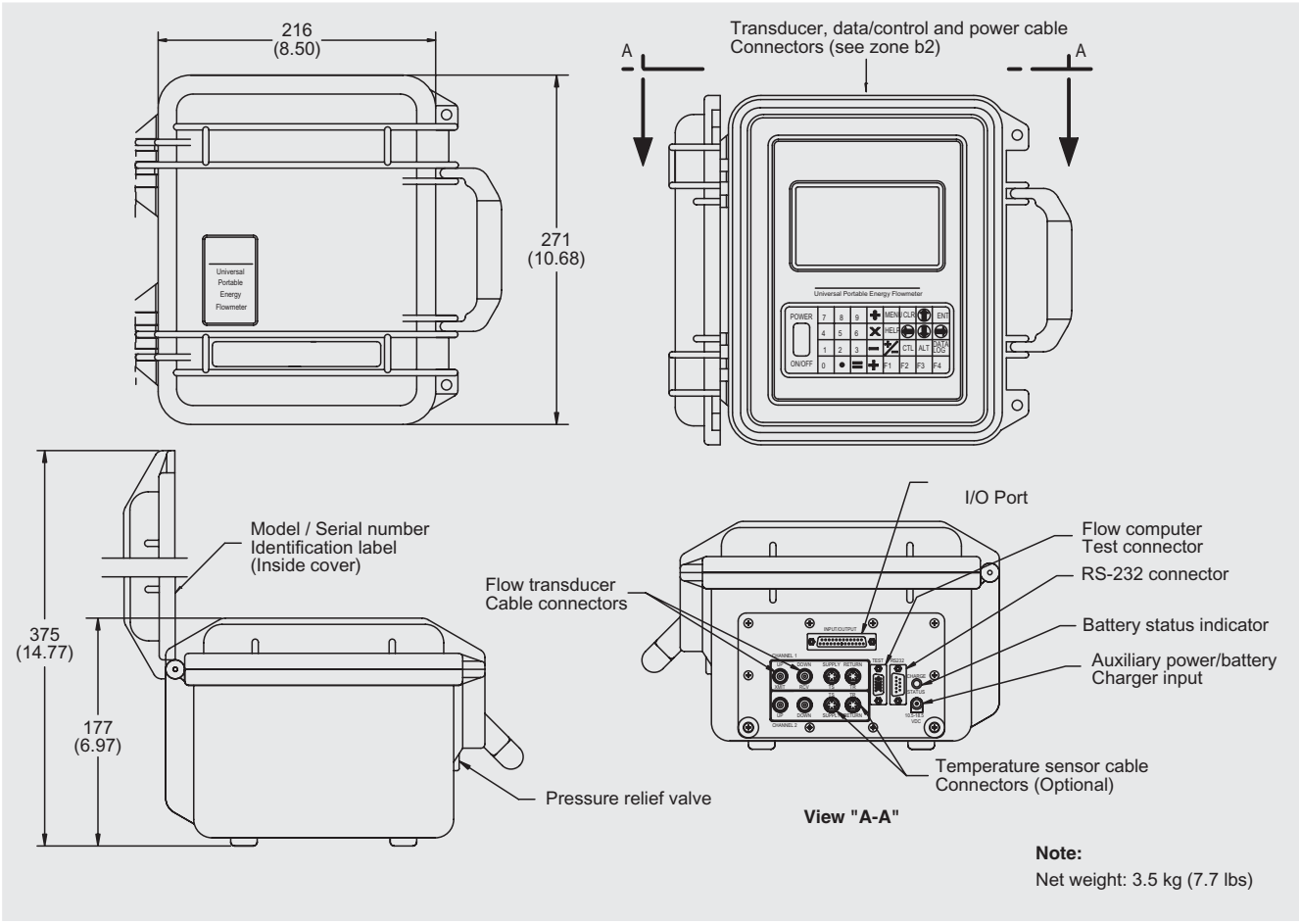
Clamp-on ultrasonic flowmeters
System information and selection guide

FUP1010 IP40 (NEMA 12) Standard portable enclosure



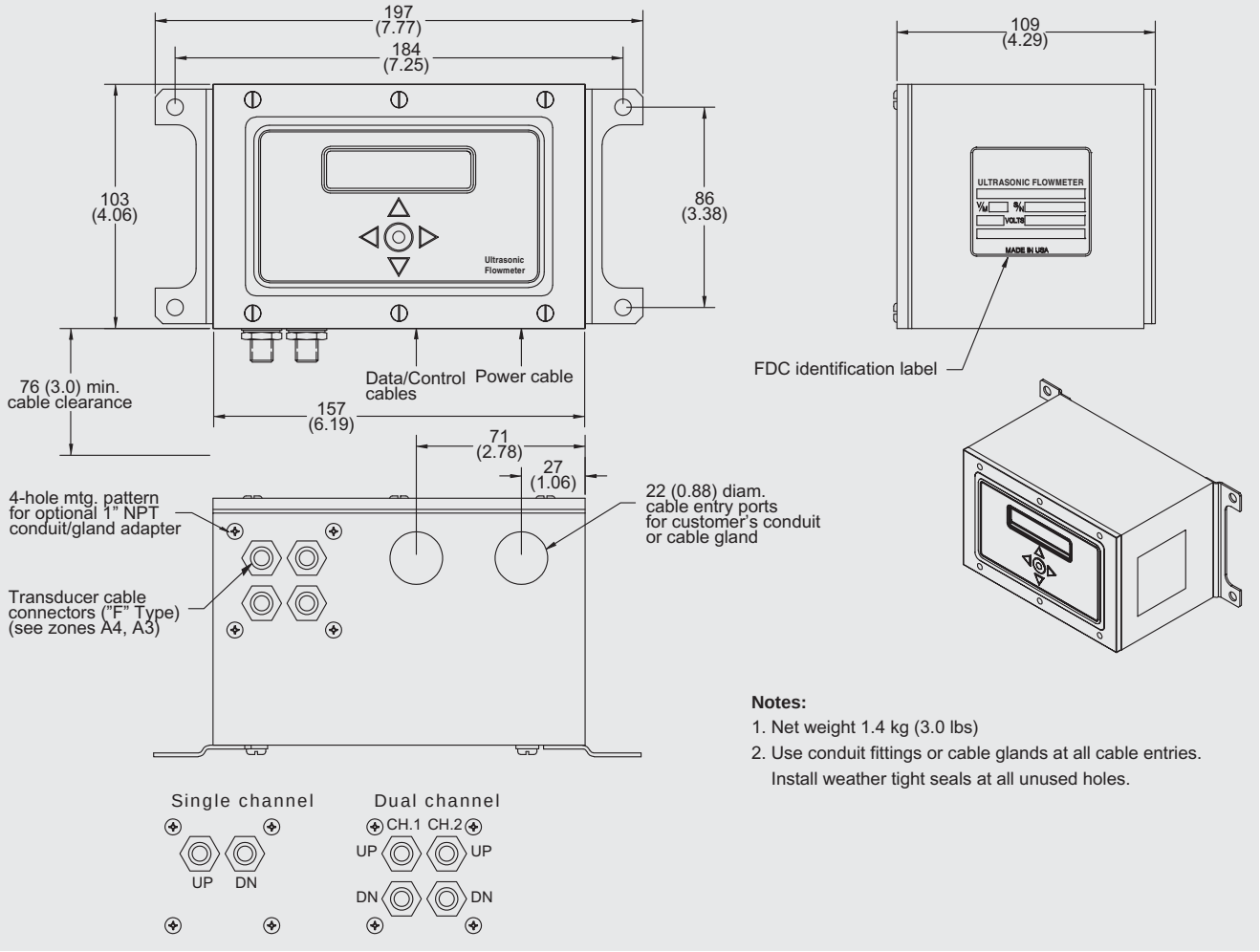
Note:
Net weight: 3.4 kg (7.5 lbs)

FUE1010 IP40 (NEMA 12) Portable impact resistant enclosure



Clamp-on ultrasonic flowmeters
System information and selection guide

FUS1020 IP65 (NEMA 4) Wall mount enclosure



Notes:

1. Net weight 1.4 kg (3.0 lbs)
2. Use conduit fittings or cable glands at all cable entries. Install weather tight seals at all unused holes.

SITRANS FUS1010 Standard clamp-on

Overview

SITRANS FUS1010 is the most versatile clamp-on ultrasonic flowmeter available today. It can operate in either WideBeam Transit-Time or Reflexor (Doppler) mode, making it suitable for virtually any liquid, even those with high aeration or suspended solids.

SITRANS FUS1010 is available in single, dual channel/dual path and optional four channel/four path configurations. You have a choice of IP65 (NEMA 4X), IP65 (NEMA7) and IP66 (NEMA) 7) explosion proof enclosures.

Benefits

- Versatility; there is no need to change meters when operating conditions change
- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to foul or wear
- No pressure drop or energy loss
- Wide turn-down ratio
- Choice of single channel or dual channel/dual path, with doppler capability. Four channel/four beam optional.
  - Optional four channels allow measurement of four independent pipes at the same time, reducing overall ownership costs
  - Dual mode allows for transit time and reflexor operation at the same time on the same pipe
  - Dual path allows for two sets of transducers to be set up on one pipe and averaged for higher accuracy
- Zeromatic Path automatically sets zero without stopping flow and reduces zero drift, even at low flow

Application

FUS1010 is suitable for a wide variety of liquid applications, including the following:

- Water industry
  - Raw water
  - Potable water
  - Sludges
  - Chemicals
- Wastewater industry
  - Raw sewage
  - Effluent
  - Sludges
  - Mixed liquor
  - Chemicals
- HVAC industry
  - Chillers
  - Condensers
  - Hot and cold water systems
- Power industry
  - Nuclear
  - Fossil
  - Hydroelectric
- Processing industry
  - Process control
  - Batching
  - Rate indication
  - Volumetric and mass measurement

Design

FUS1010 is available in three configurations:

- IP65 (NEMA 4X) enclosure
  - Single channel
  - Dual channel / dual path
  - Four channel (optional)
- IP65 (NEMA 7) Compact explosion proof enclosure
  - Single channel
  - Dual channel / dual path
- IP66 (NEMA 7) Wall mount explosion proof enclosure
  - Single channel
  - Dual channel / dual path
  - Four channel (optional)

Function

- IP65 (NEMA 4X) and IP66 (NEMA 7) flow display computers have integral 33 button keypads and large (128 x 240 pixel) graphic displays visible up to 12 m (40 ft) away
- IP65 (NEMA 7) compact flow display computer has a 2 x 16 Alphanumeric LCD display
- Current, voltage, status alarm, frequency and RS232 outputs (see specification section for details)
- Optional current, voltage and temperature inputs (see specification section for details)
- Zeromatic Path automatically sets zero
- Bidirectional flow operation
- 1 MByte data logger with both site and data logger storage
- English, Spanish, German, Italian and French language options

SITRANS FUS1010 Standard clamp-on

Technical specifications

SITRANS FUS1010, IP65 (NEMA 4X) Flow display computer

Enclosure IP65 (NEMA 4X)	
Input	
Flow range	± 12 m/s (± 40 ft/s), bidirectional
Pipe size	6.4 mm ... 9.14 m (0.25“ ... 360“)
Optional inputs Single channel	• Current: 2x 4 … 20 mA DC • Voltage: 2x 0 … 10 V DC • Temperature: 2x 4 wire 1 kΩ RTD
Output	
Outputs Single channel	• Current: 2x 4 … 20 mA DC (1 kΩ at 30 V DC) • Voltage: 2x 0 … 10 V DC (5 kΩ min.) • Status Alarm: 4x SPDT relays • Frequency: 2x 0 … 5 kHz • RS232
Accuracy	
Accuracy	± 0.5% ... 1.0% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0015 ... 0.003 m/s (± 0.005 ... 0.01 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Batch repeatability	± 0.15% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0005 m/s (± 0.0015 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Data refresh rate	5 Hz
Rated operation conditions	
Degree of protection	IP65 (NEMA 4X)
Liquid temperature	
• Standard	-40 ... +120 °C (-40 ... +250 °F)
• Optional	-40 ... +230 °C (-40 ... +450 °F)
Ambient temperature	-18 … +60 °C (0 … 140 °F)
Design	
Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
Weight	see diagrams
Power supply	90 ... 240 V AC, 50 ... 60 Hz, 30 VA or 9 ... 36 V DC, 12 W

Indication and operation	
Data logger memory	1 MByte
Display	128 x 240 pixel LCD with back-light
Keypad	33 keypad buttons with tactile feedback
Language options	English, Spanish, German, Italian, French
Certificates and approvals	
FM and CSA ratings	I.S. Class 1, 2, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	
• Flow display computer	Ex II (1) G [EEx ia] IIC Ex II 3 (1) G EEx nC [ia] IIC T5
• Transducers	Ex II 1 G EEx ia IIC T5 Ex II 2 G EEx m II T5 (for use with flowmeter in safe area)
CCOE rating	EEx (ia)
CEPEL ratings	
• Flow display computer	[BR-Ex ia] IIC T6 (pending on 4 channel) BR-Ex nC [ia] IIC T6 (pending)
• Transducers	BR-Ex ia IIC T6 IP65
GoST ratings	
• Flow display computer	[Exia]IIC
• Transducers	0ExiaIICT5

SITRANS FUS1010 Standard clamp-on

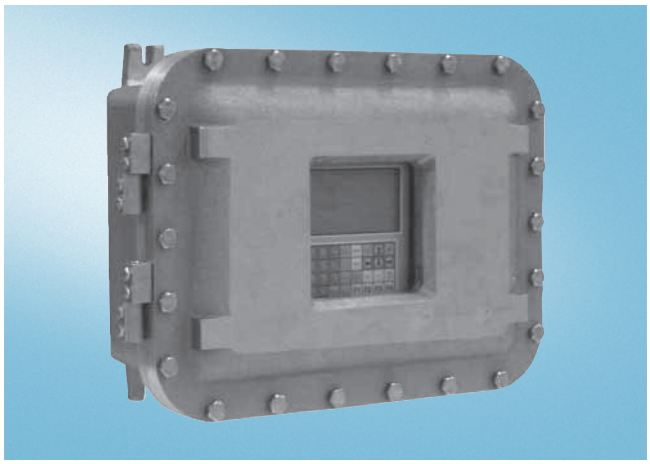
SITRANS FUS1010, IP65 (NEMA 7) Compact explosion proof

Enclosure IP65 (NEMA 7)	
Input	
Flow range	± 12 m/s (± 40 ft/s), bidirectional
Pipe size	6.4 mm ... 9.14 m (0.25“ ... 360“)
Optional inputs single channel	• Current: 1x 4 … 20 mA DC • Temperature: 2x 4 wire 1 kΩ RTD
Output	
Outputs single channel	• Current (externally powered): 1x 4 … 20 mA DC (1 kΩ at 30 V DC) • Status Alarm: 1x Isolated open collector • Frequency: 2x 0 … 5 kHz • RS232
Accuracy	
Calibratable accuracy	0.1% (API proving method)
Intrinsic accuracy	± 0.5% ... 1.0% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0015 ... 0.003 m/s (± 0.005 ... 0.01 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Batch repeatability	± 0.15% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0005 m/s (± 0.0015 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Data refresh rate	5 Hz
Rated operation conditions	
Degree of protection	IP65 (NEMA 7)
Liquid temperature	
• Standard	-40 ... +120 °C (-40 ... +250 °F)
• Optional	-40 ... +230 °C (-40 ... +450 °F)
Ambient temperature	-18 … +60 °C (0 … 140 °F)
Design	
Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
Weight	see diagrams
Power supply	90 ... 240 V AC, 50 ... 60 Hz, 15 VA or 9 ... 36 V DC, 10 W

Indication and operation	
Data logger memory	1 MByte
Display	2 x 16 alphanumeric LCD display
Keypad	5 Magnetic hall effect switches
Language options	English, Spanish, German, Italian, French
Certificates and approvals	
FM and CSA ratings	Ex Class 1, Div 1 D-I Class 2, Div 1 I.S. Class 1, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	
• Flow display computer	Ex II 2 (1) G EEx d [ia] IIC T5
• Transducers	Ex II 1 G EEx ia IIC T5
CCOE rating	EEx d
CEPEL ratings	
• Flow display computer	BR-Ex d [ia] IIC T6
• Transducers	BR-Ex ia IIC T6 IP65

SITRANS FUS1010 Standard clamp-on

SITRANS FUS1010, IP66 (NEMA 7) Wall mount explosion proof enclosure



4

Enclosure IP66 (NEMA 7)	
Input	
Flow range	± 12 m/s (± 40 ft/s), bidirectional
Pipe size	6.4 mm ... 9.14 m (0.25“ ... 360“)
Optional Inputs single channel	• Current: 2x 4 … 20 mA DC • Voltage: 2x 0 … 10 V DC • Temperature: 2x 4 wire 1 kΩ RTD
Output	
Outputs single channel	• Current: 2x 4 … 20 mA DC (1 kΩ at 30 V DC) • Voltage: 2x 0 … 10 V DC (5 kΩ min.) • Status Alarm: 4x SPDT Relays • Frequency: 2x 0 … 5 kHz • RS232
Accuracy	
Accuracy	± 0.5% ... 1.0% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0015 ... 0.003 m/s (± 0.005 ... 0.01 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Batch repeatability	± 0.15% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0005 m/s (± 0.0015 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Data refresh rate	5 Hz
Rated operation conditions	
Degree of protection	IP66 (NEMA 7)
Liquid temperature	
• Standard	-40 ... +120 °C (-40 ... +250 °F)
• Optional	-40 ... +230 °C (-40 ... +450 °F)
Ambient temperature	-18 … +60 °C (0 … 140 °F)
Design	
Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
Weight	see diagrams
Power supply	90 ... 240 V AC, 50 ... 60 Hz, 30 VA or 9 ... 36 V DC, 12 W

Indication and operation	
Data logger memory	1 MByte
Display	128 x 240 pixel LCD with back-light
Keypad	33 keypad buttons with tactile feedback
Language options	English, Spanish, German, Italian, French
Certificates and approvals	
FM and CSA ratings	Ex Class 1, Div 1 D-I Class 2, Div 1 I.S. Class 1, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	
• Flow display computer	Ex II (1) G [EEx ia] IIC Ex II 3 (1) G EEx nC [ia] IIC T5 Ex II 2 (1) G EEx d [ia IIC] IIB T5 Ex II 2 (1) G EEx d [ia IIC] IIB + H2 T5
• Transducers	Ex II 1 G EEx ia IIC T5
CEPEL ratings	
• Flow display computer	[BR-Ex ia] IIC T6 (pending) BR-Ex nC [ia] IIC T6 (pending) BR-Ex d [ia] IIC T6 (pending)
• Transducers	BR-Ex ia IIC T6 IP65

SITRANS FUS1010 Standard clamp-on

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUS1010 Standard clamp-on		
• IP65 (NEMA 4X)	7ME3530-	
• IP65 (NEMA 7) compact	7ME3531-	
• IP66 (NEMA 7) wall mounted	7ME3532-	
	0-	
Number of channels/ultrasonic beams		
Single channel	1	
Dual channel / Dual beam	2	
Special: Four channel / Four Beam (NEMA 4X and NEMA 7 wall mount only)	9	H1Y
Flowmeter functions and I/O configurations includes graphic or digital display and Reflexor capability for all except IP65 (NEMA 7) compact units		
IP65 (NEMA 4X) and IP66 (NEMA 7 wall mounted) units		
• Type 1 Standard - 2x 0 ... 10 V - 2x 4 ... 20 mA - 2x pulse output - 4x relay C type	A	
• Type 3 option adder - UniMass capability with 2x RTD input and - 4x 4 ... 20 mA analog input	C	
IP65 (NEMA 7) compact units		
• Type 1 Standard - 1x 4 ... 20 mA (Loop) and 1x status (open collector) **per channel** - 1x pulse output for single channel units only	D	
• Type 3 option adder - UniMass capability with 1 RTD input and - 1x analog input **per channel**	F	
• Other version (Expanded I/O and/or Mercury wetted relays) Add order code and plain text.	Z	J1Y
Meter power options		
90 ... 240 V AC	A	
9 ... 36 V DC (except compact NEMA 7)	B	
9 ... 36 V DC negative GND (compact only)	J	
9 ... 36 V DC positive GND (compact only)	K	
Communication options		
RS232 (standard)	0	
MODBUS (dedicated only, excludes NEMA 7 compact)	1	
Ethernet (dedicated only, excludes NEMA 7 compact	2	
Special: Dial up Modem (dedicated only, excludes compact NEMA 7)	9	L1Y
RTD temperature sensor (includes mounting hardware for pipes between 1.5“ and 24“ outer diameter)		
No RTDs	0	
1x standard clamp-on RTD	1	
2x standard clamp-on RTD	2	
1x submersible clamp-on RTD	3	
2x submersible clamp-on RTD	4	
Special (for insert style RTDs)	9	N1Y

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUS1010 Standard clamp-on		
• IP65 (NEMA 4X)	7ME3530-	
• IP65 (NEMA 7) compact	7ME3531-	
• IP66 (NEMA 7) wall mounted	7ME3532-	
	0-	
Transducer for channel 1 (includes pipe mounting kit and spacer bar for indicated max. OD listed) See „Transducer selection charts“ for specifications.		
no transducer		A
A2 universal to 3“/track mount		B
B3 universal to 5“/track mount		C
C3 universal to 13“/mounting frame		D
D3 universal to 24“/mounting frame		E
E2 universal to 48“/mounting frame		F
A1H (high precision) to 3“/track mount		G
A2H (high precision) to 3“/track mount		H
A3H (high precision) to 3“/track mount		J
B1H (high precision) to 5“/track mount		K
B2H (high precision) to 5“/track mount		L
C1H (high precision) to 24“/mounting frame		M
C2H (high precision) to 24“/mounting frame		N
D1H (high precision) to 48“/mounting frame		P
D2H (high precision) to 48“/mounting frame		Q
D4H (high precision) to 48“/mounting frame		R
Doppler to 12“ with strap kit (not for IP65 (NEMA 7))		S
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.		Z P1Y
Transducer for channel 2 (includes pipe mounting kit for indicated max. OD listed) See „Transducer selection charts“ for specifications.		
no transducer		A
A2 universal to 3“/track mount		B
B3 universal to 5“/track mount		C
C3 universal to 13“/mounting frame		D
D3 universal to 24“/mounting frame		E
E2 universal to 48“/mounting frame		F
A1H (high precision) to 3“/track mount		G
A2H (high precision) to 3“/track mount		H
A3H (high precision) to 3“/track mount		J
B1H (high precision) to 5“/track mount		K
B2H (high precision) to 5“/track mount		L
C1H (high precision) to 24“/mounting frame		M
C2H (high precision) to 24“/mounting frame		N
D1H (high precision) to 48“/mounting frame		P
D2H (high precision) to 48“/mounting frame		Q
D4H (high precision) to 48“/mounting frame		R
Doppler to 12“ with chain or strap kit (not for IP65 (NEMA 7))		S
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.		Z Q1Y
Approvals		
no approval		0
FM/CSA		1
ATEX EEx ia		2
CEPEL		3
Special ATEX EEx m add Order code and plain text: Length of integral cable:		9 R1Y

SITRANS FUS1010 Standard clamp-on

Selection and Ordering data	Order code
Further designs	
Please add „-Z“ to Order No. and specify Order code(s).	
Cable assembly for transducers (add for No. of channels) See „Transducer cable selection chart“	**K..**
Cable assembly for RTDs (add for No. of RTDs) See „RTD cable selection chart“	**R..**
Cable termination kit (for one cable pair)	
• Termination for standard, plenum and armored transducer cable	**T01**
• Termination for submersible transducer cable	**T11**
• RTD cable termination kit for standard RTD	**T21**
• RTD cable termination kit for submersible RTD	**T31**
Languages (Meter, Labels and Documentation)	
• German	**B10**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
Wet flow transfer calibration	
• Standard In-house 6 point calibration (up to 6“ or DN 150)	**D10**
Tag name plate	
• Stainless steel with 12 mm characters (max 15 char.)	**Y17**
• Stainless steel with 8 mm characters (max 15 char.)	**Y19**

MLFB example

Application example

A clamp-on meter is required for a 12“ carbon steel jet fuel line, with a wass thickness of 12.7 mm (0.5“). Meter electronics is to be located in a Class 1 Div 2 area only 18 m (60 ft) from the pipeline. 12 V DC power is available at the site.

Dual beam operation is desired for improved accuracy and redundant measurement.

MLFB Order No.: **7ME3530-2AB00-0QQ1-Z**
K03 + K03

Selection and Ordering data	Order-No.	Ord. code
FUS1010 meter family	7ME353 - 0 -	
IP65 (NEMA 4X) enclosure	0	
Dual Beam	2	
Standard I/O option	A	
9 ... 36 V DC power option	B	
RS232 Standard	0	
No RTD required	0	
Transducer code for path 1	Q	
Transducer code for path 2	Q	
FM approval required	1	
30 m (100 ft) transducer cable for path 1		K03
30 m (100 ft) transducer cable for path 2		K03

Transducer selection charts

Universal transducers for any pipe material

Transducer Size code	Order Code	Outer diameter range (mm) min.	Outer diameter range (mm) max.	Outer diameter range (inches) min.	Outer diameter range (inches) max.
A2	**B**	12.7	50.8	0.5	2
B3	**C**	19	127	0,75	5
C3	**D**	51	305	2	12
D3	**E**	203	610	8	24
E2	**F**	254	6096	10	240

High precision transducers for steel pipe with outer diameter/wall thickness ratio >10

Transducer Size code	Order Code	Pipe wall (mm) min.	Pipe wall (mm) max.	Pipe wall (inches) min.	Pipe wall (inches) max.
A1H	**G**	0.64	1.02	0.025	0.04
A2H	**H**	1.02	1.52	0.04	0.06
A3H	**J**	1.52	2.03	0.06	0.08
B1H	**K**	2.03	3.05	0.08	0.12
B2H	**L**	3.05	4.06	0.12	0.16
C1H	**M**	4.06	5.84	0.16	0.23
C2H	**N**	5.84	8.13	0.23	0.32
D1H	**P**	8.13	11.18	0.32	0.44
D2H	**Q**	11.18	15.75	0.44	0.62
D4H	**R**	15.75	31.75	0.62	1.25

Transducer cable selection chart

Transducer cable codes for length and type options

Cable length m (ft)	Standard (PVC jacket) -40…+80 °C (-40…+176 °F)	Submersible (polyethylene jacket) -40…+80 °C (-40…+176 °F)	Plenum Rated (teflon jacket) -40…+200 °C (-40…+392 °F)	Armored -40…+80 °C (-40…+176 °F)
	Order code			
6 (20)	**K01**	**K11**	**K21**	**K31**
15 (50)	**K02**	**K12**	**K22**	**K32**
30 (100)	**K03**	**K13**	**K23**	**K33**
46 (150)	**K04**	**K14**	**K24**	**K34**
61 (200)	**K05**	**K15**	**K25**	**K35**
91 (300)	**K06**	**K16**	**K26**	**K36**

RTD cable selection chart

RTD cable codes for length and type

Cable length m (ft)	Standard (teflon wrapped) -40 ... +200 °C (-40 … +392 °F)	Submersible (extruded jacket) -40 ... +200 °C (-40 … +392 °F)
	Order code	
6 (20)	**R01**	**R11**
15 (50)	**R02**	**R12**
30 (100)	**R03**	**R13**
46 (150)	**R04**	**R14**
61 (200)	**R05**	**R15**
91 (300)	**R06**	**R16**

SITRANS FUP1010 Portable clamp-on

Overview

SITRANS FUP1010 clamp-on non-intrusive ultrasonic flowmeter offers maximum versatility plus battery power for portable field use. It can operate in either WideBeam Transit-Time or reflexor (Doppler) mode, making it suitable for virtually any liquid, even those with high aeration or suspended solids.

SITRANS FUP1010 is available in single and dual channel or dual path configurations, with your choice of IP67/63 (NEMA 6/3R) waterproof or IP40 (NEMA 12) enclosures.

Benefits

- Battery power facilitates field use; the meter is easily transported from one installation to another – saving time for surveys, monitoring and temporary installations
- Weatherproof model can be used outdoors and left in place without concern for rain damage
- Weatherproof model's rugged plastic case enables it to withstand rough treatment that would destroy most other meters
- Versatility - there is no need to change meters when operating conditions change
- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to wear or foul
- No pressure drop or energy loss
- Wide turn-down ratio
- Choice of single or dual channel models minimizes total cost
- Zeromatic Path automatically sets zero without stopping flow and reduces zero drift, even at low flow

Application

FUP1010 is suitable for a wide variety of liquid applications, including the following:

- Water industry
  - Raw water
  - Potable water
  - Sludges
  - Chemicals
- Wastewater industry
  - Raw sewage
  - Effluent
  - Sludges
  - Mixed liquor
  - Chemicals
- HVAC industry
  - Chillers
  - Condensers
  - Hot and cold water systems
  - Thermal energy rate and total
- Power industry
  - Nuclear
  - Fossil
  - Hydroelectric
- Processing industry
  - Process control
  - Batching
  - Rate indication
  - Volumetric and mass measurement

Design

FUP1010 is available in two configurations:

- IP40 (NEMA 12) Enclosure
  - Single channel
  - Dual channel / dual path
- IP67/63 (NEMA 6/3R) Weatherproof / Impact resistant enclosure
  - Single channel
  - Dual channel / dual path

Function

- Integral 33 button keypad and large (128 x 240 pixel) graphic display visible up to 12 m (40 ft) away
- Current, voltage, frequency and RS232 outputs (see specification section for details)
- Optional current, voltage and temperature inputs (see specification section for details)
- Zeromatic Path automatically sets zero
- Bi-directional flow operation
- 1 MByte data logger with both site and data logger storage
- English, spanish, german, italian and french language options
- Optional pipe wall thickness gauge

SITRANS FUP1010 Portable clamp-on

Technical specifications

SITRANS FUP1010	
Input	
Flow range	± 12 m/s (± 40 ft/s), bidirectional
Pipe size	6.4 mm … 9.14 m (0.25“ … 360“)
Optional inputs, single channel	• Current: 2x 4 … 20 mA DC • Voltage: 2x 0 … 10 V DC • Temperature: 2x 4 wire 1 kΩ RTD
Output	
Outputs, single channel	• Current: 2x 4 … 20 mA DC (1 kΩ at 30 V DC) • Voltage: 2x 0 … 10 V DC (5 kΩ minimum) • Status Alarm: 4x SPDT Relays • Frequency: 2x 0 … 5000 Hz • RS232
Accuracy	
Accuracy	± 0.5% … 2% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0015 … 0.006 m/s (± 0.005 … 0.02 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Batch repeatability	± 0.15% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0005 m/s (± 0.0015 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Rated operation conditions	
Degree of protection	
• Standard portable enclosure	• IP40 (NEMA 12)
• Weatherproof/impact resistant	• IP67/63 (NEMA 6/3R)
Liquid temperature	
• Standard	-40 … +120 °C (-40 … +250 °F)
• Optional	-40 … +230 °C (-40 … +450 °F)
Ambient temperature	-18 … +60 °C (0 … 140 °F)
Design	
Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
Weight	see diagrams
Power supply	
Power	Internal NiCd battery
Battery operation	4 hours
Indication and operation	
Data logger memory	1 MByte
Site storage memory	50 sites minimum
Display	128 x 240 pixel LCD with back-light
Keypad	33 keypad buttons with tactile feedback
Language options	English, Spanish, German, Italian, French
Certificates and approvals	
Safety ratings	UL ULc CE: • LVD IEC 61010-1 • EMC EN61000-6-2, -4

SITRANS FUP1010 Portable clamp-on

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUP1010 Portable clamp-on		
• IP67 (NEMA 6) weather proof battery powered	7ME3510-	
• IP40 (NEMA 12) battery powered	7ME3511-	
	■■■■■-0■■0	■■■
Number of channels/ultrasonic beams		
Single channel	1	
Dual channel / Dual beam	2	
Standard flowmeter types and I/O configurations		
• Type 1 Standard - Reflexor capable - Graphic display - 2x 0 ... 10 V - 2x 4 ... 20 mA - 2x pulse outputs - 4x status logic	A	
• Type 3 option adder - 2x 4 ... 20 mA analog in - 2x RTD	C	
Transducer cables (select proper quantity for active channels)		
no transducer cable	A	
1x Plenum rated, length 6 m (20 ft) (for NEMA 6)[1]	B	
2x Plenum rated, length 6 m (20 ft) (for NEMA 6)[1]	C	
1x Plenum rated, length 15 m (50 ft) (for NEMA 6)[1]	D	
2x Plenum rated, length 15 m (50 ft) (for NEMA 6)[1]	E	
1x PVC jacket, length 6 m (20 ft) (for NEMA 12)[2]	F	
2x PVC jacket, length 6 m (20 ft) (for NEMA 12)[2]	G	
1x PVC jacket, length 15 m (50 ft) (for NEMA 12)[2]	H	
2x PVC jacket, length 15 m (50 ft) (for NEMA 12)[2]	J	
Other versions add Order code and plain text.	Z	K1Y
RTD temperature sensor (for type 3 meter only, mounting hardware and cable included)		
No RTDs	0	
1x standard clamp-on RTD (NEMA 12) with 6 m (20 ft) cable[1]	1	
2x standard clamp-on RTD (NEMA 12) with 6 m (20 ft) cable[1]	2	
1x standard clamp-on RTD (NEMA 12) with 15 m (50 ft) cable[1]	3	
2x standard clamp-on RTD (NEMA 12) with 15 m (50 ft) cable[1]	4	
1x standard clamp-on RTD (NEMA 6) with 6 m (20 ft) cable[1]	5	
2x standard clamp-on RTD (NEMA 6) with 6 m (20 ft) cable[1]	6	
1x standard clamp-on RTD (NEMA 6) with 15 m (50 ft) cable[1]	7	
2x standard clamp-on RTD (NEMA 6) with 15 m (50 ft) cable[1]	8	
Other versions add Order code and plain text.	9	L1Y

[1] -40 ... +200 °C (-40 ... +392 °F)
[2] -40 ... +80 °C (-40 ... +176 °F)

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUP1010 Portable clamp-on		
• IP67 (NEMA 6) weather proof battery powered	7ME3510-	
• IP40 (NEMA 12) battery powered	7ME3511-	
	■■■■■-0■■0	■■■
Battery charger options		
no battery charger	0	
Charger Type A for Europe (CEE7/7)	1	
Charger Type C for Australia (AS3112)	2	
Charger Type D for U.K. (BS1363)	3	
Charger Type J for Japan (JIS8303)	4	
Charger Type K for U.S. (NEMA 5-15P)	5	
Charger Type L for Switzerland (SEV1011)	6	
Special: External battery for extended service, add Order code and plain text.	9	M1Y
Transducer for channel 1 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications.		
no transducer		A
A2 universal	to 3“/track mount	B
B3 universal	to 5“/track mount	C
C3 universal	to 13“/mounting frame	D
D3 universal	to 24“/mounting frame	E
E2 universal	to 48“/mounting frame	F
A1H (high precision)	to 3“/track mount	G
A2H (high precision)	to 3“/track mount	H
A3H (high precision)	to 3“/track mount	J
B1H (high precision)	to 5“/track mount	K
B2H (high precision)	to 5“/track mount	L
C1H (high precision)	to 24“/mounting frame	M
C2H (high precision)	to 24“/mounting frame	N
D1H (high precision)	to 48“/mounting frame	P
D2H (high precision)	to 48“/mounting frame	Q
D4H (high precision)	to 48“/mounting frame	R
Doppler	to 12“ with chain kit	S
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.		Z P1Y
Transducer for channel 2 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications.		
no transducer		A
A2 universal	to 3“/track mount	B
B3 universal	to 5“/track mount	C
C3 universal	to 13“/mounting frame	D
D3 universal	to 24“/mounting frame	E
E2 universal	to 48“/mounting frame	F
A1H (high precision)	to 3“/track mount	G
A2H (high precision)	to 3“/track mount	H
A3H (high precision)	to 3“/track mount	J
B1H (high precision)	to 5“/track mount	K
B2H (high precision)	to 5“/track mount	L
C1H (high precision)	to 24“/mounting frame	M
C2H (high precision)	to 24“/mounting frame	N
D1H (high precision)	to 48“/mounting frame	P
D2H (high precision)	to 48“/mounting frame	Q
D4H (high precision)	to 48“/mounting frame	R
Doppler	to 12“ with chain kit	S
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.		Z Q1Y

SITRANS FUP1010 Portable clamp-on

Selection and Ordering data	Order code
Further designs	
Please add „-Z“ to Order No. and specify Order code(s).	
Languages (Meter, Labels and Documentation)	
• German	**B10**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
Wet flow transfer calibration	
• Standard In-house 6-point calibration (up to DN 150 or 6“)	**D10**
Tag name plate	
• Stainless steel with 12 mm characters (max. 15 characters)	**Y17**
• Stainless steel with 8 mm characters (max. 15 characters)	**Y19**

MLFB example

Application example

A general survey portable flowmeter is required for pipes sizes ranging from 76 ... 500 mm (3“ ... 20“) with both cast iron and steel material. Doppler may be required as liquid may be moderately aerated.

Requires language support for German.

MLFB Order No.: **7ME3510-2AB01-0DE0-Z**
B10

Selection and Ordering data	Order-No.	Ord. code
FUP1010 meter family	7ME3510 -	0
IP67 (NEMA 6) weather proof	0	
Dual channel	2	
Portable Type 1 I/O with Doppler capable	A	
2 Plenum rated transducer cables 20 ft	B	
No RTDs required	0	
Charger Type A for Europe (CEE7/7)	1	
Transducer for DN 50 ... DN 300 (2“ ... 12“) pipes	D	
Transducer for DN 200 ... DN 600 (8“ ... 24“) pipes	E	
German language support		B10

Transducer Selection Charts

Universal transducers for any pipe material

Transducer Size Code	Order Code	Outer diameter range (mm)		Outer diameter range (inches)	
		min	max	min	max
A2	**B**	12.7	50.8	0.5	2
B3	**C**	19	127	0.75	5
C3	**D**	51	305	2	12
D3	**E**	203	610	8	24
E2	**F**	254	6096	10	240

High precision transducers for steel pipe with outer diameter/wall thickness ratio > 10

Transducer Size Code	Order Code	Pipe wall (mm)		Pipe wall (inches)	
		min	max	min	max
A1H	**G**	0.635	1.016	0.025	0.04
A2H	**H**	1.016	1.524	0.04	0.06
A3H	**J**	1.524	2.032	0.06	0.08
B1H	**K**	2.032	3.048	0.08	0.12
B2H	**L**	3.048	4.064	0.12	0.16
C1H	**M**	4.064	5.842	0.16	0.23
C2H	**N**	5.842	8.128	0.23	0.32
D1H	**P**	8.128	11.176	0.32	0.44
D2H	**Q**	11.176	15.748	0.44	0.62
D4H	**R**	15.748	31.75	0.62	1.25

SITRANS FUE1010 Energy clamp-on

Overview

SITRANS FUE1010 is a highly accurate clamp-on non-intrusive ultrasonic flowmeter for revenue grade thermal energy sub-metering and energy efficiency distribution monitoring, with a real time coefficient of performance (COP) for HVAC systems.

SITRANS FUE1010 is available in single and dual channel or dual path configurations, with your choice of IP65 (NEMA 4X) dedicated wall mount or IP40 (NEMA 12) portable enclosures.

Benefits

- Measures energy rate and total consumption with highest accuracy available
- Accurately measures at both low flow rates and low differential temperatures
- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to foul or wear
- No pressure drop or energy loss
- Wide turn-down ratio
- Choice of single or dual channel / dual path or dual mode operation:
  - Dual channel operation reduces the cost for the system on a per channel measurement basis and permits measuring hot and chilled water lines at the same time
  - Dual path capability insures high flow measurement accuracy on installations with less than desirable piping runs
- Ability to operate in either Wide-Beam Transit-time or reflexor (Doppler) mode for applications with high aeration
- Zeromatic Path automatically sets zero without stopping flow and reduces zero drift, even at low flow

Application

FUE1010 is ideally suited to thermal energy / power industry applications, including:

- Chilled water sub-metering
- Hot water sub-metering
- Condenser water
- Glycol
- Thermal storage
- Lake source cooling

Design

FUE1010 is available in three configurations:

- IP65 (NEMA 4X) Enclosure
  - Single channel
  - Dual channel / dual path
- IP40 (NEMA 12) Portable Enclosure
  - Single channel
- IP40 (NEMA 12) Portable Impact Resistant Enclosure
  - Dual channel / dual path

Function

- Flow display computer has an integral 33 button keypad and large (128 x 240 pixel) graphic display visible up to 12 m (40 ft) away
- 4-wire 1000 Ω platinum RTD's for supply and return temperature measurements are precision matched to within 0.01 °C (0.02 °F)
- Temperature is factory calibrated with built-in field calibrator
- Built-in energy/BTU mode
- Detection of aeration and cavitation caused by worn or damaged impellers, misaligned shafts, etc.
- Reverse flow and empty pipe detection
- Chiller efficiency analysis: accepts an independent analog input representing kW usage for calculation of the following functions which can be selected for data logging or output purposes:
  - Cooling load (kW/ton)
  - Coefficient of performance (COP)
  - Energy efficiency ratio (EER)
- Optional current inputs
- Digital communication options:
  - MODBUS / Metasys N2 (IP65 (NEMA 4X) only)
  - Dial-up modem (IP65 (NEMA 4X) only)
  - RJ45 TCP/IP addressable Ethernet (IP65 (NEMA 4X) only)
  - RS232 Serial digital port (standard)
- Zeromatic Path automatically sets zero
- Bi-directional flow operation
- 1 MByte data logger with both site and data logger storage
- English, Spanish, German, Italian and French language options

SITRANS FUE1010 Energy clamp-on

Technical specifications

SITRANS FUE1010	
Input	
Flow range	0 … 12 m/s (0 … 40 ft/s), bi-directional
Flow sensitivity	0.0003 m/s (0.001 ft/s)
Pipe size	6.4 mm … 9.14 m (0.25“ … 360“)
Optional Inputs, single channel	• Current: 2x 4 … 20 m • Voltage: 2x 0 … 10 V DC • Temperature: 2x 4 wire 1 kΩ RTD • Totalizer commands (clear/hold)
Output	
Outputs, single channel	• Current: 2x 4 … 20 mA DC (1 kΩ at 30 V DC) • Voltage: 2x 0 … 10 V DC (5 kΩ minimum) • Status Alarm: 4x SPDT Relays • Frequency: 2x 0 … 5000 Hz • RS232
Accuracy	
Accuracy	± 0.5% ... 1.0% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0015 ... 0.003 m/s (± 0.005 ... 0.01 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Batch repeatability	± 0.15% of flow, for velocities greater than 0.3 m/s (1 ft/s) ± 0.0005 m/s (± 0.0015 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Rated operation conditions	
Degree of protection	Dedicated wall mount enclosure: IP65 (NEMA 4X) Portable enclosures: IP40 (NEMA 12)
Liquid Temperature	
• Standard	-40 … +120 °C (-40 … +250 °F)
• Optional	-40 … +230 °C (-40 … +450 °F)
Transducer temperature	
• Standard	-40 … +120 °C (-40 … +250 °F)
• Optional	-62 … +232 °C (-80 … +450 °F)
Ambient temperature	-18 ... +60 °C (0 ... 140 °F)
Design	
Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
Weight	see diagrams
Power supply	90 … 240 V AC, 50-60 Hz, 30 VA or 9 … 36 V DC, 12 W
Indication and operation	
Data logger memory	1 Mbyte of storage
Display	128 x 240 pixel LCD with backlight
Keypad	33 keypad buttons with tactile feedback
Language options	English, Spanish, German, Italian, French

Certificates and approvals

Safety ratings	
• Dedicated wall mount enclosure	FM FMc CE • LVD IEC 61010-1 • EMC EN61000-6-2, -4
• Portable enclosures	UL ULc CE • LVD IEC 61010-1 • EMC EN61000-6-2, -4

SITRANS FUE1010 Energy clamp-on

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUE1010 Energy clamp-on		
• Dedicated IP65 (NEMA 4X)	7ME3500-	
• Portables IP40 (NEMA 12) battery powered	7ME3502-	
	-0	
Number of channels/ultrasonic beams Dedicated meter		
Dedicated meter		
Single channel	1	
Dual channel / Dual beam	2	
Portables		
Single channel	3	
Dual channel / Dual beam	4	
Flowmeter functions and I/O configurations		
• Portable Type 1 Standard - Reflexor capability - Graphic display - 2x 0 ... 10 V - 2x 4 ... 20 mA - 2x pulse output - 4x status logic	A	
• Portable Type 3 option adder - Energy efficiency COP/EER output - 2x 4 ... 20 mA analog input	C	
• Dedicated Type 1 Standard - Reflexor capability - Graphic display - 2x 0 ... 10 V - 2x 4 ... 20 mA - 2x pulse output - 4x relay C type	D	
• Dedicated Type 3 option adder - Reflexor capability - Energy efficiency COP/EER output - 2x 4 ... 20 mA analog input	F	
• Specials (Expanded I/O and or Mercury wetted relays for dedicated only) Add Order code and plain text.	Z	J1Y
Meter power options		
90 ... 230 V AC (Dedicated only)	A	
9 ... 36 V DC (Dedicated only)	B	
Charger Type A for Europe (CEE7/7)	C	
Charger Type C for Australia (AS3112)	D	
Charger Type D for U.K. (BS1363)	E	
Charger Type J for Japan (JIS8303)	F	
Charger Type K for U.S. (NEMA 5-15P)	G	
Charger Type L for Switzerland (SEV1011)	H	
No Charger	J	
Other versions (External battery for extended service with portable meter) Add Order code and plain text.	Z	K1Y
Communication options		
RS232 (standard)	0	
MODBUS (dedicated only)	1	
Ethernet (dedicated only)	2	
Other versions (Dial up Modem (dedicated only)) Add Order code and plain text.	9	L1Y

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUE1010 Energy clamp-on		
• Dedicated IP65 (NEMA 4X)	7ME3500-	
• Portables IP40 (NEMA 12) battery powered	7ME3502-	
	-0	
RTD temperature sensor (includes mounting hardware for pipes above 1.5“ outer diameter)		
No RTDs (Note: temperature input is required for energy system)	0	
1x pair standard clamp-on RTD (NEMA 4X only)	1	
2x pair standard clamp-on RTD (for dual channel NEMA 4X only)	2	
1x pair standard clamp-on RTD (NEMA 12 portable)	3	
2x pair standard clamp-on RTD (for dual channel NEMA 12 portable)	4	
1x pair submersible clamp-on RTD (NEMA 4X only)	5	
2x pair submersible clamp-on RTD (for dual channel NEMA 4X only)	6	
Special (for insert style RTDs)	9	M1Y
Transducer for channel 1 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications.		
no transducer		A
A2 universal to 3“/track mount		B
B3 universal to 5“/track mount		C
C3 universal to 13“/mounting frame		D
D3 universal to 24“/mounting frame		E
E2 universal to 48“/mounting frame		F
A1H (high precision) to 3“/track mount		G
A2H (high precision) to 3“/track mount		H
A3H (high precision) to 3“/track mount		J
B1H (high precision) to 5“/track mount		K
B2H (high precision) to 5“/track mount		L
C1H (high precision) to 24“/mounting frame		M
C2H (high precision) to 24“/mounting frame		N
D1H (high precision) to 48“/mounting frame		P
D2H (high precision) to 48“/mounting frame		Q
D4H (high precision) to 48“/mounting frame		R
Doppler to 12“ with chain or strap kit		S
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.		Z P1Y

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SITRANS FUE1010 Energy clamp-on

Selection and Ordering data		Order-No.	Ord. code
SITRANS FUE1010 Energy clamp-on			
• Dedicated IP65 (NEMA 4X)		7ME3500-	
• Portables IP40 (NEMA 12) battery powered		7ME3502-	
		-0	
Transducer for channel 2 (includes pipe mounting kit for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications.			
no transducer			A
A2 universal	to 3“/track mount		B
B3 universal	to 5“/track mount		C
C3 universal	to 13“/mounting frame		D
D3 universal	to 24“/mounting frame		E
E2 universal	to 48“/mounting frame		F
A1H (high precision)	to 3“/track mount		G
A2H (high precision)	to 3“/track mount		H
A3H (high precision)	to 3“/track mount		J
B1H (high precision)	to 5“/track mount		K
B2H (high precision)	to 5“/track mount		L
C1H (high precision)	to 24“/mounting frame		M
C2H (high precision)	to 24“/mounting frame		N
D1H (high precision)	to 48“/mounting frame		P
D2H (high precision)	to 48“/mounting frame		Q
D4H (high precision)	to 48“/mounting frame		R
Doppler	to 12“ with chain or strap kit		S
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.			Z Q1 Y
Approvals			
no approval			0
FM / Dedicated			1
UL / Portable			2

Selection and Ordering data	Order code
Further designs	
Please add „-Z“ to Order No. and specify Order code(s).	
Cable assembly for transducers (add for # of channels) See „Transducer cable selection chart“	**K..**
Cable assembly for RTDs (add for # of RTDs) See „RTD cable selection chart“	**R..**
Cable termination kit (for one cable pair)	
• Termination for standard, plenum and armored transducer cable	**T01**
• Termination for submersible transducer cable	**T11**
• RTD cable termination kit for standard RTD	**T21**
• RTD cable termination kit for submersible RTD	**T31**
Languages (Meter, Labels and Documentation)	
• German	**B10**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
Wet flow transfer calibration	
• Standard In-house 6 point calibration (up to 6“ or DN 150)	**D10**
Tag name plate	
• Stainless steel with 12 mm characters (max 15 char.)	**Y17**
• Stainless steel with 8 mm characters (max 15 char.)	**Y18**

MLFB example

Application example

A dedicated clamp-on energy meter is required for two separate returns lines. Both will use clamp-on RTDs for the supply and return lines. AC power is available and data access will be via MODBUS communication.

Pipe 1 is a DN150 (6“) schedule 40 carbon steel line
Pipe 2 is a DN 300 (12“) ductile iron line

MLFB Order No.: **7ME3500-2DA10-2NE0-Z**
K03 + K05 + R03 + R05 + R02 + R03

Selection and Ordering data	Order-No.	Ord. code
FUE1010 meter family	7ME350-0-	
IP65 (NEMA 4X) enclosure	0	
Dual channel	2	
Dedicated Type 1 I/O option	D	
90 ... 230 V AC power option	A	
MODBUS option	1	
2 pairs of clamp-on RTDs	2	
Transducer code for 6“ pipe	N	
Transducer code for 12“ pipe	E	
No approval required	0	
30 m (100 ft) transducer cable for channel 1		K03
61 m (200 ft) transducer cable for channel 1		K05
30 m (100 ft) cable for RTD 1		R03
61 m (200 ft) cable for RTD 2		R05
15 m (50 ft) cable for RTD 3		R02
30 m (100 ft) cable for RTD 4		R03

Transducer selection charts

Universal transducers for any pipe material

Trans-ducer	Order code	Outer diameter range (mm)		Outer diameter range (inches)	
Size code		min	max	min	max
A2	**B**	12.7	50.8	0.5	2
B3	**C**	19	127	0.75	5
C3	**D**	51	305	2	12
D3	**E**	203	610	8	24
E2	**F**	254	6096	10	240

High precision transducers for steel pipe with outer diameter/wall thickness ratio > 10

Trans-ducer	Order Code	Pipe wall (mm)		Pipe wall (inches)	
Size code		min	max	min	max
A1H	**G**	0.635	1.016	0.025	0.04
A2H	**H**	1.016	1.524	0.04	0.06
A3H	**J**	1.524	2.032	0.06	0.08
B1H	**K**	2.032	3.048	0.08	0.12
B2H	**L**	3.048	4.064	0.12	0.16
C1H	**M**	4.064	5.842	0.16	0.23
C2H	**N**	5.842	8.128	0.23	0.32
D1H	**P**	8.128	11.176	0.32	0.44
D2H	**Q**	11.176	15.748	0.44	0.62
D4H	**R**	15.748	31.75	0.62	1.25

Transducer cable selection chart

Transducer cable codes for length and type options

Cable length m (ft)	Standard (PVC jacket) -40…+80 °C (-40…+176 °F)	Submersible[1] (polyethylene jacket) -40…+80 °C (-40…+176 °F)	Plenum Rated (teflon jacket) -40…+200 °C (-40…+392 °F)	Armored[1] -40…+80 °C (-40…+176 °F)
	Order code			
6 (20)	**K01**	**K11**	**K21**	**K31**
15 (50)	**K02**	**K12**	**K22**	**K32**
30 (100)	**K03**	**K13**	**K23**	**K33**
46 (150)	**K04**	**K14**	**K24**	**K34**
61 (200)	**K05**	**K15**	**K25**	**K35**
91 (300)	**K06**	**K16**	**K26**	**K36**

[1] Submersible and armored transducer cable is not available for portable versions.

RTD cable selection chart

RTD cable codes for length and type

Cable length m (ft)	Standard (teflon wrapped) -40 ... +200 °C (-40 … +392 °F)	Submersible[1] (extruded jacket) -40 ... +200 °C (-40 … +392 °F)
	Order code	
6 (20)	**R01**	**R11**
15 (50)	**R02**	**R12**
30 (100)	**R03**	**R13**
46 (150)	**R04**	**R14**
61 (200)	**R05**	**R15**
91 (300)	**R06**	**R16**

[1] Submersible RTD cable is not available for portable versions.

SITRANS FUH1010 Oil clamp-on

Overview

SITRANS FUH1010 clamp-on non-intrusive ultrasonic flowmeter is ideal for applications carrying crude oil, refined petroleum or liquefied gas.

SITRANS FUH1010 has three application areas: Interface detectors, volumetric flowmeters and mass or standard volume flowmeters.

Benefits

For all FUH1010 products

- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to foul or wear
- No pressure drop or energy loss
- Wide turn-down ratio, 30:1
- Choice of single, dual, or optional, three or four beam versions.
  - Single beam version reduces initial investment
  - Two or optional three and four beam versions provide higher accuracy, especially where limited straight run or poor flow profile exists
- Wide-Beam technology
  - Helps provide improved accuracy over a wide range of liquid conditions and flow rates
  - Accommodates pipelines transporting multiple liquid products
- Zeromatic Path automatically corrects for zero drift without stopping flow

Interface detectors / Density meters ("interface detector")

- Outputs liquid density and API as a direct replacement for intrusive densitometers
- Exceptional repeatability is maintained, independent of changes in temperature, pressure or viscosity
- No need for straight run

Viscosity compensated volumetric flowmeters ("precision volume")

- Moderate cost
- Precise measurement is maintained with automatic „Reynolds Number" compensation for temperature and viscosity changes

Standard volume (net) mass flowmeters ("standard volume / mass")

- Exceptional repeatability is maintained, independent of changes in temperature, density or viscosity
- Batch interface and product quality diagnostics provided
- Density and API outputs provided
- Scraper („pig") detection provided

Application

Interface detectors / Density meters

- Precise identification of interfaces on multi-liquid pipelines
- Rapid and precise scraper "pig" indication
- Product identification
- Density indication

Viscosity compensated volumetric flowmeters

- Applications with multiple liquids having a wide viscosity range
- Automatic gross volume compensation due to viscosity changes

Standard volume (net) mass flowmeters

- Standard (net) volume flow measurement
- Suitable for use in leak detection systems
- Mass flow output measurement
- Interface detection
- „Pig" detection
- Chemical and petrochemical processing

Design

FUH1010 is available in three enclosures:

- IP65 (NEMA 4X) Enclosure
  - Single beam
  - Dual beam
  - Optional four beam
- IP65 (NEMA 7) Compact explosion proof enclosure
  - Single beam
  - Dual beam (option)
- IP66 (NEMA 7) Wall mount explosion proof enclosure, waterproof
  - Single beam
  - Dual beam
  - Four beam (optional)

Function

- IP65 (NEMA 4X) and IP66 (NEMA 7) flow display computers have integral 33 button keypads and large (128 x 240 pixel) graphic displays visible up to 12 m (40 ft) away
- IP65 (NEMA 7) compact flow display computer has a 2 x 16 alphanumeric LCD display
- Current, voltage, status alarm, frequency and RS232 outputs (see specification section for details)
- Analog inputs (see specification section for details)
- Zeromatic Path automatically corrects for zero drift
- Bidirectional flow operation
- 1 MByte data logger with both site and data logger storage
- English, Spanish, German, Italian and French language options

Technical specifications

SITRANS FUH1010

Specifications for interface detectors

Accuracy	
Accuracy	± 0.05 of API No.
Repeatability	± 0.01 of API No.

Specifications for volumetric and mass flowmeters

Input	
Flow range	± 12 m/s (± 40 ft/s), bidirectional
Flow sensitivity	0.0003 m/s (0.001 ft/s), flow rate independent
Accuracy	
Calibratable accuracy	± 0.15% … 0.3% of flow, depending on version
Batch repeatability	± 0.05% of flow, maximum

Specifications for all FUH1010 products

Input	
Pipe size	6.4 mm ... 9.14 m (0.25“ ... 360“)
Analog inputs	• Current: 4x 4 ... 20 mA (IP65 (NEMA 7) enclosure has (2))
Output	
Outputs	• Current: 2x 4 … 20 mA (1 kΩ at 30 VDC) • Voltage: 2x 0 … 10 V DC (5 kΩ minimum) (None for IP65 (NEMA 7) enclosure) • 1x 0 ... 5 kHz Pulse Rate, Digital Quad. (None for IP65 (NEMA 7) enclosure) • RS232 Serial Port
Optional outputs	• MODBUS (not for IP65 (NEMA 7) enclosure) • Ethernet (not for IP65 (NEMA 7) enclosure) • RS232 standard • Telephone modem (not for IP65 (NEMA 7) enclosure) • Up to 4x additional 4 ... 20 mA (not for IP65 (NEMA 7) enclosure) • 4x Mercury wetted relays (not for IP65 (NEMA 7) enclosure) • Up to 4x digital pulse (not for IP65 (NEMA 7) enclosure)
Status/Alarm I/O	• 4x Programmable relays (not for IP65 (NEMA 7) enclosure) • 2x Optically coupled output logic gates (for IP65 (NEMA 7) enclosure, only) • 1x Totalizer clear switch input (not for IP65 (NEMA 4X) enclosure)[1)] • 1x Totalizer hold switch input (not for IP65 (NEMA 7) enclosure)[1)] • 1x Opto iso. totalizer clear switch input (for IP65 (NEMA 7) enclosure, only)[1)] • 1x Opto iso. totalizer hold switch input (for IP65 (NEMA 7) enclosure, only)[1)]
Accuracy	
Zero Drift	0.0003 m/s (0.001 ft/s), with Zero-Matic Path active (not provided for interface detector)
Data refresh rate	5 Hz (80 Hz output for flow rate available on special order)
Rated operation conditions	
Degree of protection	
• Wall mount enclosure	IP65 (NEMA 4X)
• Compact explosion proof	IP65 (NEMA 7)
• Wall mount explosion proof	IP66 (NEMA 7)
Liquid temperature	
• Standard	-40 ... +120 °C (-40 ... +250 °F)
• Optional	-40 ... +230 °C (-40 ... +450 °F)
Ambient temperature	-18 ... +60 °C (0 ... 140 °F)
Design	
Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
Weight	see diagrams
Power supply	
• IP65 (NEMA 4X) and IP66 (NEMA 7) Wall Mount	90 ... 240 V AC, 50 … 60 Hz, 30 VA or 9 ... 36 V DC, 12 W
• IP65 (NEMA 7) Compact	90 ... 240 V AC, 50 ... 60 Hz, 15 VA or 9 ... 36 V DC, 10 W
Indication and operation	
Data logger memory	1 MByte
Display	
• IP65 (NEMA 4X) and IP66 (NEMA 7) Enclosures	128 x 240 pixel LCD with backlight
• IP65 (NEMA 7) Enclosure	2 x 16 Alphanumeric LCD Display
Keypad	
• IP65 (NEMA 4X) and IP66 (NEMA 7) Enclosures	33 keypad buttons with tactile feedback
• IP65 (NEMA 7) Enclosure	5 Magnetic hall effect switches
Language options	English, Spanish, German, Italian, French

[1)] Totalizer switch inputs are not provided for the interface detector

SITRANS FUH1010 Oil clamp-on

Certificates and approvals

IP65 (NEMA 4X) flow display computer ratings

FM and CSA ratings	I.S. Class 1, 2, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	• Flowmeter: Ex II (1) G [EEx ia] IIC EX II 3 (1) G EEx nC [ia] IIC T5 • Transducers: Ex II 1 G EEx ia IIC T5 Ex II 2 G EEx m II T5 (For use with flowmeter in safe area only)
CCOE rating	EEx (ia)
CEPEL Ratings	• Flowmeter: [BR-Ex ia] IIC T6 (pending on 4 channel) BR-Ex nC [ia] IIC T6 (pending) • Transducers: BR-Ex ia IIC T6 IP65
GoST ratings	Flowmeter: [Exia]IIC Transducers: 0ExiaIICT5

IP65 (NEMA 7) compact explosion proof enclosure ratings

FM and CSA ratings	Ex Class 1, Div 1 D-I Class 2, Div 1 I.S. Class 1, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	• Flowmeter: Ex II 2 (1) G EEx d [ia] IIC T5 • Transducers: Ex II 1 G EEx ia IIC T5 Ex II 2 G EEx m II T5
CCOE rating	EEx d
CEPEL ratings	• Flowmeter: BR-Ex d [ia] IIC T6 • Transducers: BR-Ex ia IIC T6 IP65

IP66 (NEMA 7) wall mount explosion proof enclosure ratings

FM and CSA ratings	Ex Class 1, Div 1 D-I Class 2, Div 1 I.S. Class 1, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	• Flowmeter: Ex II (1) G [EEx ia] IIC Ex II 3 (1) G EEx nC [ia] IIC T5 Ex II 2 (1) G EEx d [ia IIC] IIB T5 Ex II 2 (1) G EEx d [ia IIC] IIB+H2 T5 • Transducers: Ex II 1 G EEx ia IIC T5
CEPEL ratings	• Flowmeter: [BR-Ex ia] IIC T6 (pending) BR-Ex nC [ia] IIC T6 (pending) BR-Ex d [ia] IIC T6 (pending) • Transducers: BR-Ex ia IIC T6 IP65

SITRANS FUH1010 Oil clamp-on

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUH1010 Oil clamp-on		
• IP65 (NEMA 4X)	7ME3600-	
• IP65 (NEMA 7) compact	7ME3601-	
• IP66 (NEMA 7) wall mounted	7ME3602-	
	0-	
Number of ultrasonic beams / meter type		
Single beam (precision volume)	0	
Single beam (interface detector)	1	
Dual channel/Dual beam (interface detector)	2	
Dual beam (precision volume)	3	
Dual beam (standard volume / mass)	4	
Special: Four beam (NEMA 4X and NEMA 7 wall mount only)	9	H1Y
Flowmeter functions and I/O configurations		
Includes graphic or digital display		
IP65 (NEMA 4X) and IP66 (NEMA 7 wall mounted) units		
• Standard - Graphic display - 4x 4 ... 20 mA analog input - 2x 0 ... 10 V - 2x 4 ... 20 mA analog output - 2x pulse output - 4x relay C type - 2x RTD input	A	
• Custody Transfer - additional 2x 4 ... 20 mA outputs - Mercury wetted relays - 4x digital pulse outputs (2x open collector and 2x 0 ... 5 V TTL)	C	
IP65 (NEMA 7) compact units		
• Standard - Digital display - 2x 4 ... 20 mA (Loop) - 2x 4 ... 20 mA analog input - 2x status (open collector) - 1x RTD input	D	
• Custody Transfer - 1x digital pulse open collector output	F	
• Other version (Expanded I/O for non-custody meters or dry contact relays for custody) Add order code and plain text	Z	J1Y
Meter power options		
90 ... 240 V AC	A	
9 ... 36 V DC (except compact NEMA 7)	B	
9 ... 36 V DC negative GND (compact only)	J	
9 ... 36 V DC positive GND (compact only)	K	
Communication options		
RS232 (standard)	0	
MODBUS (excludes NEMA 7 compact)	1	
Ethernet (excludes compact NEMA 7)	2	
Special: Dial up Modem (excludes compact NEMA 7)	9	L1Y

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUH1010 Oil clamp-on		
• IP65 (NEMA 4X)	7ME3600-	
• IP65 (NEMA 7) compact	7ME3601-	
• IP66 (NEMA 7) wall mounted	7ME3602-	
	0-	
RTD temperature sensor (includes mounting hardware for pipes above 1.5“ OD)		
No RTDs (Note: temperature input is required for FUH systems)	0	
1x standard clamp-on RTD	1	
2x standard clamp-on RTD	2	
1x submersible clamp-on RTD	3	
2x submersible clamp-on RTD	4	
Special (for insert style RTDs)	9	N1Y
Transducer for channel/beam 1 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications		
no transducer	A	
A1H (high precision) to 3“/track mount	G	
A2H (high precision) to 3“/track mount	H	
A3H (high precision) to 3“/track mount	J	
B1H (high precision) to 5“/track mount	K	
B2H (high precision) to 5“/track mount	L	
B3H (high precision) to 5“/track mount	T	
C1H (high precision) to 24“/mounting frame	M	
C2H (high precision) to 24“/mounting frame	N	
D1H (high precision) to 48“/mounting frame	P	
D2H (high precision) to 48“/mounting frame	Q	
D3H (high precision) to 48“/mounting frame	U	
D4H (high precision) to 48“/mounting frame	R	
Other versions (different size, mount, type of pipe larger than DN 600 (24“) or corrosion resistant), add Order code and plain text.	Z	P1Y
Transducer for channel/beam 2 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications		
no transducer	A	
A1H (high precision) to 3“/track mount	G	
A2H (high precision) to 3“/track mount	H	
A3H (high precision) to 3“/track mount	J	
B1H (high precision) to 5“/track mount	K	
B2H (high precision) to 5“/track mount	L	
B3H (high precision) to 5“/track mount	T	
C1H (high precision) to 24“/mounting frame	M	
C2H (high precision) to 24“/mounting frame	N	
D1H (high precision) to 48“/mounting frame	P	
D2H (high precision) to 48“/mounting frame	Q	
D3H (high precision) to 48“/mounting frame	U	
D4H (high precision) to 48“/mounting frame	R	
Other versions (different size, mount, type of pipe larger than DN 600 (24“) or corrosion resistant), add Order code and plain text.	Z	Q1Y
Approvals		
FM/CSA (default)	1	
ATEX EEx ia	2	
CEPEL	3	
Special ATEX EEx m add Order code and plain text: Length of integral cable:	9	R1Y

SITRANS FUH1010 Oil clamp-on

Selection and Ordering data	Order code
Further designs	
Please add „-Z“ to Order No. and specify Order code(s).	
Cable assembly for transducers (add for # of beams) See „Transducer cable selection chart“	**K..**
Cable assembly for RTDs (add for # of RTDs) See „RTD cable selection chart“	**R..**
Cable termination kit (for one cable pair)	
• Termination for standard, plenum and armored transducer cable	**T01**
• Termination for submersible cable	**T11**
• RTD cable termination kit for standard RTD	**T21**
• RTD cable termination kit for submersible RTD	**T31**
Languages (Meter, Labels and Documentation)	
• German	**B10**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
Tag name plate	
• Stainless steel with 12 mm characters (max 15 char.)	**Y17**
• Stainless steel with 8 mm characters (max 15 char.)	**Y19**

MLFB example

Application example

A clamp-on meter is required for a 12“ carbon steel hydrocarbon line flowing multiple products, with a wall thickness of 12.7 mm (0.5“). Meter electronics is to be located in a Class 1 Div 2 area only 60 ft from the pipeline. 12 V DC power is available at the site.

Dual beam operation is desired for improved accuracy and redundant measurement. Pulse output will be primary flow data source.

MLFB Order No.: **7ME3600-3CB00-3QQ1-Z**
K03 + K03 + R03

Selection and Ordering data	Order-No.	Ord. code
FUH1010 meter family	**7ME360** -	0 -
IP65 (NEMA 4X) enclosure	0	
Dual beam precision volume	3	
Custody Transfer option with digital pulse	C	
9 ... 36 V DC power option	B	
RS232 Standard	0	
RTD required for viscosity comp		3
Transducer code for path 1		Q
Transducer code for path 2		Q
FM approval required		1
30 m (100 ft) transducer cable for path 1		K03
30 m (100 ft) transducer cable for path 2		K03
30 m (100 ft) cable for RTD		R03

Transducer Selection Charts

High precision transducers for steel pipe with outer diameter/wall thickness ratio >10

Transducer Size code	Order Code	Pipe wall (mm) min.	Pipe wall (mm) max.	Pipe wall (inches) min.	Pipe wall (inches) max.
A1H	**G**	0.64	1.02	0.025	0.04
A2H	**H**	1.02	1.52	0.04	0.06
A3H	**J**	1.52	2.03	0.06	0.08
B1H	**K**	2.03	3.05	0.08	0.12
B2H	**L**	3.05	4.06	0.12	0.16
C1H	**M**	4.06	5.84	0.16	0.23
C2H	**N**	5.84	8.13	0.23	0.32
D1H	**P**	8.13	11.18	0.32	0.44
D2H	**Q**	11.18	15.75	0.44	0.62
D4H	**R**	15.75	31.75	0.62	1.25
B3H	**T**	2.7	3.3	0.106	0.128
D3H	**U**	7.4	9.0	0.293	0.354

Transducer Cable Selection Chart

Transducer cable codes for length and type options

Cable length m (ft)	Standard (PVC jacket) -40…+80 °C (-40…+176 °F)	Submersible (polyethylene jacket) -40…+80 °C (-40…+176 °F)	Plenum Rated (teflon jacket) -40…+200 °C (-40…+392 °F)	Armored -40…+80 °C (-40…+176 °F)
	Order code			
6 (20)	**K01**	**K11**	**K21**	**K31**
15 (50)	**K02**	**K12**	**K22**	**K32**
30 (100)	**K03**	**K13**	**K23**	**K33**
46 (150)	**K04**	**K14**	**K24**	**K34**
61 (200)	**K05**	**K15**	**K25**	**K35**
91 (300)	**K06**	**K16**	**K26**	**K36**

RTD Cable Selection Chart

RTD cable codes for length and type

Cable length m (ft)	Standard (teflon wrapped) -40 ... +200 °C (-40 … +392 °F)	Submersible (extruded jacket) -40 ... +200 °C (-40 … +392 °F)
	Order code	
6 (20)	**R01**	**R11**
15 (50)	**R02**	**R12**
30 (100)	**R03**	**R13**
46 (150)	**R04**	**R14**
61 (200)	**R05**	**R15**
91 (300)	**R06**	**R16**

SITRANS FUG1010 Gas clamp-on

Overview

SITRANS FUG1010 clamp-on non-intrusive ultrasonic flowmeter is ideal for natural and process gas applications, including checkmetering, allocation, production, storage and gas fired power station applications.

SITRANS FUG1010 is available in single, dual and optional four beam configurations, with your choice of IP65 (NEMA 4X) or IP65 (NEMA 7) and IP66 (NEMA 7) explosion proof enclosures.

Benefits

- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to foul or wear as found in turbine and PD meters
- Eliminates the pressure drop or energy loss in orifice metering
- Wide turn-down ratio
- Choice of single, dual or optional four beam versions
  - Single beam version reduces initial investment
  - Multiple beam versions provide higher accuracy, especially with limited straight run and poor flow profile conditions
  - In diametric reflect mode configuration, the meter is less sensitive to crossflow and swirl
- Wide-Beam technology provides improved accuracy over a wide range of flow velocity and operating pressure
- Zeromatic Path automatically sets zero without stopping flow and reduces zero drift, even at low flow
- Tolerant of most wet gas conditions
- Immune to most pressure reducing valve noise
- Optional rugged stainless steel transducer enclosure permits permanent and direct burial installations
- Easy to use “DataView” diagnostic software

Application

SITRANS FUG1010 is ideal for most natural and process gas industry applications, including:

- Checkmetering
- Allocation
- Flow survey verification
- Lost and unaccounted for (LAUF) gas analysis
- Production
- Storage

Design

FUG1010 is available in three enclosures:

- IP65 (NEMA 4X) enclosure
  - Single beam
  - Dual beam
  - Four beam (optional)
- IP65 (NEMA 7) Compact explosion proof enclosure
  - Single beam
  - Dual beam
- IP66 (NEMA 7) Wall mount explosion proof enclosure
  - Single beam
  - Dual beam
  - Four beam (optional)

Function

- IP65 (NEMA 4X) and IP66 (NEMA 7) flow display computers have integral 33 button keypads and large (128 x 240 pixel) graphic displays visible up to 12 m (40 ft) away
- IP65 (NEMA 7) compact flow display computer has a 2x 16 alphanumeric LCD display
- Current, voltage, frequency and RS232 outputs (see specification section for details)
- Analog inputs for pressure and temperature
- Zeromatic Path automatically compensates for zero flow drift
- Bidirectional flow operation
- 1 Mbyte data logger with both site and data logger storage
- English, Spanish, German, Italian and French language options
- Internal AGA-8 table for fixed gas composition is available for standard volume computation
- Complete application and operation diagnostics, to assure calibration and operational integrity
- Upward compatibility and compliance with expected AGA-10 speed of sound measurement practice

SITRANS FUG1010 Gas clamp-on

Technical specifications

SITRANS FUG1010

Input	
Flow range	± 30 m/s (± 100 ft/s), bidirectional
Flow sensitivity	0.0003 m/s (0.001 ft/s), flow rate independent
Minimum pressure	7 … 10 bar (100 … 145 psi), typical (gas composition and application dependent; plastic pipes support operation at atmospheric pressure)
Pipe size	25 mm … 1.52 m (1“ … 60“) (for other sizes, consult factory)
Analog inputs	Current: 4x 4 … 20 mA, programmable (IP65 (NEMA 7) enclosure has (2x))
Output	
Outputs	• Current: 2x 4 … 20 m, a programmable, standard Additional 2x optional, except IP65 (NEMA 7) • Voltage: 2x 0 … 10 V DC, menu programmable (None for IP65 (NEMA 7) enclosure) • 2x Open collector digital pulses (quadrature) (None for IP65 (NEMA 7) enclosure) • 2x 0 … 5 kHz, TTL pulse square wave + (None for IP65 (NEMA 7) enclosure) • 1x Optically isolated digital pulse & source, IP65 (NEMA 7) enclosure only • RS232 Serial Port
Optional outputs	• MODBUS (RS485/422/232) (not for IP65 (NEMA 7) • Ethernet (not for IP65 (NEMA 7) • Telephone modem (not for IP65 (NEMA 7))
Status/Alarm I/O	• 4x programmable form C relays (not for IP65 (NEMA 7) enclosure) • 4x programmable N.O. Mer. Wet. Relays optional (not for IP65 (NEMA 7) enclosure) • 2x Optically coupled output logic gates (for IP65 (NEMA 7) enclosure, only) • 1 Totalizer clear switch input (not for IP65 (NEMA 7)) • 1 Totalizer hold switch input (not for IP65 (NEMA 7) enclosure) • 1x Opto iso. totalizer clear switch input (for IP65 (NEMA 7) enclosure, only) • 1x Opto iso. totalizer hold switch input (for IP 65 (NEMA 7) enclosure, only)

Accuracy	
Typical accuracy	1% … 2% of actual volume reading (higher accuracy is pipe condition and flow profile dependent)
Repeatability	0.05% … 0.1%, of actual volume reading, for 1.5 … 30 m/s (5 … 100 ft/s) velocities (pipe condition dependent)
Zero drift	0.0003 m/s (0.001 ft/s), with Zero-Matic Path active
Data refresh rate	5 Hz (80 Hz optional)
Rated operation conditions	
Degree of protection	
• Wall mount enclosure	IP65 (NEMA 4X)
• Compact explosion proof	IP65 (NEMA 7)
• wall mount explosion proof	IP66 (NEMA 7)
Gas temperature	-40 … +60 °C (-40 … +140 °F) (for higher temperatures consult factory)
Ambient temperature	-18 … +60 °C (0 … 140 °F)
Design	
Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
Weight	see diagrams
Power supply	
• For IP65 (NEMA 4X) and IP66 (NEMA 7)	• 90 … 240 V AC, 50 … 60 Hz (30 VA) or 9 … 36 V DC (12 W)
• For IP65 (NEMA 7):	• 90 … 240 V AC, 50 … 60 Hz (15 VA) or 9 … 36 V DC (10 W)
Indication and operation	
Data logger memory	1 Mbyte, programmable for 17 data functions
Display	
• IP65 (NEMA 4X) and IP66 (NEMA 7) enclosures	128 x 240 pixel LCD with backlight
• IP65 (NEMA 7) enclosure	2 x 16 alphanumeric LCD display
Keypad	
• IP65 (NEMA 4X) and IP66 (NEMA 7) Enclosures	33 keypad buttons with tactile feedback
• IP65 (NEMA 7) Enclosure	5 magnetic hall effect switches
Language options	English, Spanish, German, Italian, French

Certificates and approvals

IP65 (NEMA 4X) flow display computer ratings

FM and CSA ratings	I.S. Class 1, 2, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	• Flowmeter: Ex II (1) G [EEx ia] IIC Ex II 3 (1) G EEx nC [ia] IIC T5 • Transducers: Ex II 1 G EEx ia IIC T5 Ex II 2 G EEx m II T5 (for use with flowmeter in safe area)
CCOE rating	EEx (ia)
CEPEL ratings	• Flowmeter: [BR-Ex ia] IIC T6 (pending on 4 channel) • Transducers: BR-Ex ia IIC T6 IP65
GoST ratings	• Flowmeter: 0ExiaIICT5 • Transducers: [Exia]IIC

IP65 (NEMA 7) compact explosion proof enclosure ratings

FM and CSA ratings	Ex Class 1, Div 1 D-I Class 2, Div 1 I.S. Class 1, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	• Flowmeter: Ex II 2 (1) G EEx d [ia] IIC T5 • Transducers: Ex II 1 G EEx ia IIC T5
CCOE rating	EEx d
CEPEL ratings	• Flowmeter: BR-Ex d [ia] IIC T6 • Transducers: BR-Ex ia IIC T6 IP65

IP66 (NEMA 7) wall mount explosion proof enclosure ratings

FM and CSA ratings	Ex Class 1, Div 1 D-I Class 2, Div 1 I.S. Class 1, Div 1 N-I Class 1, Div 2 S Class 2, Div 2 (FM only)
ATEX ratings	• Flowmeter: Ex II (1) G [EEx ia] IIC Ex II 3 (1) G EEx nC [ia] IIC T5 Ex II 2 (1) G EEx d [ia IIC] IIB T5 Ex II 2 (1) G EEx d [ia IIC] IIB+H2 T5 • Transducers: Ex II 1 G EEx ia IIC T5
CEPEL ratings	• Flowmeter: [BR-Ex ia] IIC T6 (pending) BR-Ex nC [ia] IIC T6 (pending) BR-Ex d [ia IIC] IIB T6 (pending) BR-Ex d [ia IIC] IIB+H2 T6 (pending) • Transducers: BR-Ex ia IIC T6 IP65

SITRANS FUG1010 Gas clamp-on

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUG1010 Gas meter clamp-on		
• IP65 (NEMA 4X)	7ME3610-	
• IP 65 (NEMA 7) compact	7ME3611-	
• IP66 (NEMA 7) wall mounted	7ME3612-	
	0-	
Number of channels/ultrasonic beams		
Single beam	1	
Dual beam	2	
Special: Four beam (NEMA 4X and NEMA 7 wall mount only)	9	H1Y
Flowmeter functions and I/O configurations (includes graphic or digital display)		
IP65 (NEMA 4X) and IP66 (NEMA 7 wall mounted) units		
• Standard (all but Compact NEMA 7) - Graphic display - 4x 4 ... 20 mA analog input - 2x 0 ... 10 V - 2x 4 ... 20 mA analog output - 2x pulse output - 4x relay C type - 2x RTD input	A	
• Custody transfer option - additional 2x 4 ... 20 mA - Mercury wetted relays - 4x digital pulse outputs (2x open collector and 2x 0 ... 5 V TTL)	B	
IP65 (NEMA 7) compact units		
• Standard - Digital display - 2x 4 ... 20 mA (loop) - 2x 4 ... 20 mA analog input - 2x status (open collector) - 1x RTD input	D	
• Custody transfer option - 1x digital pulse open collector output	E	
• Other version (Expanded I/O for non-custody meters or dry contact relays for custody) Add order code and plain text.	Z	J1Y
Meter power options		
90 ... 240 V AC	A	
9 ... 36 V DC (except compact NEMA 7)	B	
9 ... 36 V DC negative GND (Compact only)	J	
9 ... 36 V DC positive GND (Compact only)	K	
Communication options		
RS232 (standard)	0	
MODBUS (excludes NEMA 7 Compact)	1	
Ethernet (excludes NEMA 7 Compact)	2	
Special: Dial up Modem (excludes compact NEMA 7)	9	L1Y
RTD temperature sensor (includes mounting hardware for pipes above 1.5“ outer diameter)		
No RTDs	0	
1x standard clamp-on RTD	1	
2x standard clamp-on RTD	2	
1x submersible clamp-on RTD	3	
2x submersible clamp-on RTD	4	
Special (for insert style RTDs)	9	N1Y

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUG1010 Gas meter clamp-on		
• IP65 (NEMA 4X)	7ME3610-	
• IP 65 (NEMA 7) compact	7ME3611-	
• IP66 (NEMA 7) wall mounted	7ME3612-	
	0-	
Transducer for channel 1 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Transducer selection chart“ for specifications.		
no transducer	A	
B1H (high precision) to 5“/track mount	K	
B2H (high precision) to 5“/track mount	L	
B3H (high precision) to 5“/track mount	T	
C1H (high precision) to 24“/mounting frame	M	
C2H (high precision) to 24“/mounting frame	N	
D1H (high precision) to 48“/mounting frame	P	
D2H (high precision) to 48“/mounting frame	Q	
D3H (high precision) to 48“/mounting frame	U	
D4H (high precision) to 48“/mounting frame	R	
Other versions (different size, mount, type of pipe larger than DN 600 (24“) or corrosion resistant), add Order code and plain text.	Z	P1Y
Transducer for channel 2 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Transducer selection chart“ for specifications.		
no transducer	A	
B1H (high precision) to 5“/track mount	K	
B2H (high precision) to 5“/track mount	L	
B3H (high precision) to 5“/track mount	T	
C1H (high precision) to 24“/mounting frame	M	
C2H (high precision) to 24“/mounting frame	N	
D1H (high precision) to 48“/mounting frame	P	
D2H (high precision) to 48“/mounting frame	Q	
D3H (high precision) to 48“/mounting frame	U	
D4H (high precision) to 48“/mounting frame	R	
Other versions (different size, mount, type of pipe larger than DN 600 (24“) or corrosion resistant), add Order code and plain text.	Z	Q1Y
Approvals		
FM/CSA (default)	1	
ATEX EEx ia	2	
CEPEL	3	
Special ATEX EEx m Add Order code and plain text: Length of integral cable:	9	R1Y

SITRANS FUG1010 Gas clamp-on

Selection and Ordering data	Order code
Further designs	
Please add „-Z“ to Order No. and specify Order code(s).	
Cable assembly for transducers (add for # of beams) See „Transducer cable selection chart“	**K..**
Cable assembly for RTDs (add for # of RTDs) See „RTD cable selection chart“	**R..**
Cable termination kit (for one cable pair)	
• Termination for standard, plenum and armored transducer cable	**T01**
• Termination for submersible transducer cable	**T11**
• RTD cable termination kit for standard RTD	**T21**
• RTD cable termination kit for submersible RTD	**T31**
Languages (Meter, Labels and Documentation)	
• German	**B10**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
Tag name plate	
• Stainless steel with 12 mm characters (max 15 char.)	**Y17**
• Stainless steel with 8 mm characters (max 15 char.)	**Y19**

MLFB example

Application example

A clamp-on meter is required for a 300 mm (12“) carbon steel gas line with a wall thickness of 12.7 mm (0.5“). Meter electronics is to be located in a Class 1 Div 2 area only 18 m (60 ft) from the pipeline. 12 V DC power is available at the site.

Dual beam operation is desired for improved accuracy and redundant measurement. Pulse output will be primary flow data source.

MLFB Order No.: **7ME3610-2BB00-0QQ1-Z**
K03 + K03

Selection and Ordering data	Order-No.	Ord. code
FUG1010 meter family	**7ME361** -	**0** -
IP65 (NEMA 4X) enclosure	**0**	
Dual beam	**2**	
Custody Transfer option with digital pulse	**B**	
9 ... 36 V DC power option	**B**	
RS232 Standard	**0**	
No RTD required		**0**
Transducer code for path 1		**Q**
Transducer code for path 2		**Q**
FM approval required		**1**
30 m (100 ft) transducer cable for path 1		**K03**
30 m (100 ft) transducer cable for path 2		**K03**

Transducer Selection Chart

High precision transducers for steel pipe with outer diameter/wall thickness ratio >10

Transducer Size code	Order Code	Pipe wall (mm) min.	Pipe wall (mm) max.	Pipe wall (inches) min.	Pipe wall (inches) max.
B1H	**K**	2.0	3.0	0.08	0.12
B2H	**L**	3.0	4.1	0.12	0.16
B3H	**T**	2.7	3.3	0.106	0.128
C1H	**M**	4.1	5.8	0.16	0.23
C2H	**N**	5.8	8.1	0.23	0.32
D1H	**P**	8.1	11.2	0.32	0.44
D2H	**Q**	11.2	15.7	0.44	0.62
D3H	**U**	7.4	9.0	0.293	0.354
D4H	**R**	15.7	31.8	0.62	1.25

Transducer Cable Selection Chart

Transducer cable codes for length and type options

Cable length m (ft)	Standard (PVC jacket) -40…+80 °C (-40…+176 °F)	Submersible (polyethylene jacket) -40…+80 °C (-40…+176 °F)	Plenum Rated (teflon jacket) -40…+200 °C (-40…+392 °F)	Armored -40…+80 °C (-40…+176 °F)
	Order code			
6 (20)	**K01**	**K11**	**K21**	**K31**
15 (50)	**K02**	**K12**	**K22**	**K32**
30 (100)	**K03**	**K13**	**K23**	**K33**
46 (150)	**K04**	**K14**	**K24**	**K34**
61 (200)	**K05**	**K15**	**K25**	**K35**
91 (300)	**K06**	**K16**	**K26**	**K36**

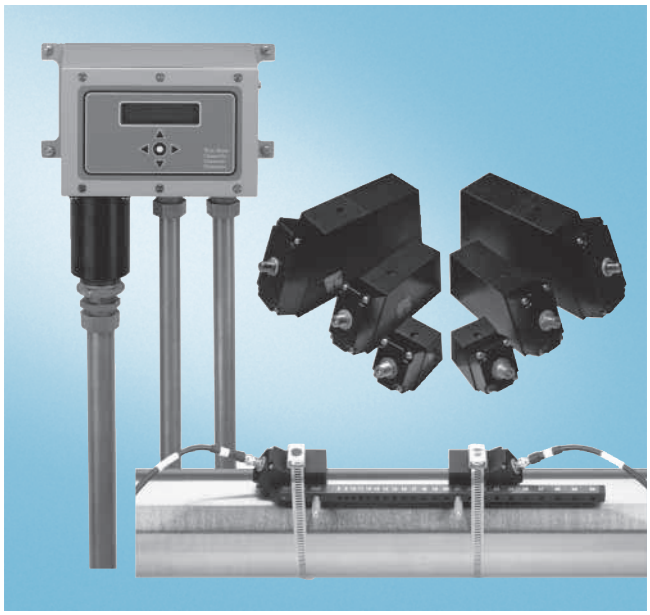
RTD Cable Selection Chart

RTD cable codes for length and type

Cable length m (ft)	Standard (teflon wrapped) -40 … +200 °C (-40 … +392 °F)	Submersible (extruded jacket) -40 … +200 °C (-40 … +392 °F)
	Order code	
6 (20)	**R01**	**R11**
15 (50)	**R02**	**R12**
30 (100)	**R03**	**R13**
46 (150)	**R04**	**R14**
61 (200)	**R05**	**R15**
91 (300)	**R06**	**R16**

SITRANS FUS1020 Basic clamp-on

Overview



SITRANS FUS1020 offers reliable flow-measurement at a much lower cost than other clamp-on ultrasonic flowmeters, with flow rate accuracy of 1% or better for most applications.

Benefits

- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to wear or foul
- No pressure drop or energy loss
- Compact, integral design reduces installation cost
- Wide turn-down ratio (80 : 1)
- Choice of single or dual channel operation
- Transducers are matched to the pipe material and have menu-driven location
- Wide-Beam technology ensures high performance
- Zeromatic Path automatically sets zero without stopping flow and eliminates zero drift

Application

FUS1020 is suitable for most clean liquid applications, including the following:

- Water & wastewater industry
  Potable water
  Wastewater, influent & effluent
  Processed sewage, sludge
- Chemical feed industry
  Sodium hypochlorite
  Sodium hydroxide
- HVAC & power industries
  Coolant flow
  Fuel flow
- Process control
  Chemicals
  Pharmaceuticals

Design

- IP65 (NEMA 4) wall mount flow display computer with separate transducers and cables
- Single and dual channel versions are available

Function

- 2x16 integral alphanumeric display and 5 key keypad for installation menu and data display
- Assignable 4 ... 20 mA isolated loop-powered output
- TTL flow pulse rate output
- RS232 digital communication port
- DB9 connector for PC communication
- Assignable open collector alarm output (40 V DC max)
- Batch totalizer start-stop control line
- Internal calibration security switch
- Remote PC installation menu
- Zeromatic Path automatically sets zero
- Bidirectional flow operation
- 1 MByte data logger with both site & data logger storage

Technical specifications

SITRANS FUS1020

Input	
Flow Range	± 12 m/s (± 40 ft/s), bi-directional
Flow Sensitivity	0.0003 m/s (0.001 ft/s) flow rate independent
Outputs	
Outputs	• Current: 4 ... 20 mA 1x for single channel 2x for dual channel • 1x 0 ... 5 kHz pulse rate, digital isolated, single channel only • RS232 serial port
Optional output	• Current: 1x 4 ... 20 mA, programmable, single channel only
Status/Alarm I/O	• Programmable form a relays (optional) 1x for single channel 2x for dual channel • Optically coupled totalizer hold switch inputs 1x for single channel 2x for dual channel • Optically isolated totalizer reset switch, single channel only
Accuracy	
Accuracy	± 0.5% ... 1.0% of flow
Batch repeatability	± 0.15%
Zero Drift	0.1% of rate; 0.0003 m/s (0.001 ft/s), with zeromatic path active
Data refresh rate	5 Hz
Rated operation conditions	
Degree of protection	IP65 (NEMA 4)
Design	
Weight	1.4 kg (3.0 lbs)
Dimensions (W x H x D)	197 x 103 x 109 mm (7.77 x 4.06 x 4.3 inches)
Power supply	110 ... 240 V AC @ 15 VA or 9 ... 36 V DC @ 10 W
Certificates and approvals	
Certifications	UL Listing ULc Listing

SITRANS FUS1020 Basic clamp-on

Selection and Ordering data	Order-No. / Ord. code
SITRANS FUS1020 Basic clamp-on, IP65 (NEMA 4)	7ME3570 - 00 - 0
Number of channels/ultrasonic beams	
Single channel	1
Dual channel / Dual beam	2
Flowmeter functions and I/O configurations	
• Blind system - 1x 4 ... 20 mA **per channel** - 1x pulse out (for single channel only)	A
• With display	E
• With display and 1x additional analog output (single channel only)	F
• With display and with SPST relay	G
• With display and 1x additional analog output and SPST relay (single channel only)	H
Meter power options	
90 ... 240 V AC	A
9 ... 36 V DC	B
Transducer for channel 1 (includes pipe mounting kit for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications.	
no transducer	A
A2 universal to 3“/track mounting	B
B3 universal to 5“/track mounting	C
C3 universal to 13“/mounting frame	D
D3 universal to 24“/mounting frame	E
E2 universal to 48“/mounting frame	F
A1H (high precision) to 3“/trackless mount.	G
A2H (high precision) to 3“/trackless mount.	H
A3H (high precision) to 3“/trackless mount.	J
B1H (high precision) to 5“/trackless mount.	K
B2H (high precision) to 5“/trackless mount.	L
C1H (high precision) to 24“/trackless mount.	M
C2H (high precision) to 24“/trackless mount.	N
D1H (high precision) to 48“/trackless mount.	P
D2H (high precision) to 48“/trackless mount.	Q
Other versions (different size, type, mounting or temperature range), add Order code and plain text.	Z P1 Y

Selection and Ordering data	Order-No. / Ord. code
SITRANS FUS1020 Basic clamp-on, IP65 (NEMA 4)	7ME3570 - 00 - 0
Transducer for channel 2 (includes pipe mounting kit for indicated max. outer diameter listed) See „Transducer selection charts“ for specifications.	
no transducer	A
A2 universal to 3“/track mounting	B
B3 universal to 5“/track mounting	C
C3 universal to 13“/mounting frame	D
D3 universal to 24“/mounting frame	E
E2 universal to 48“/mounting frame	F
A1H (high precision) to 3“/trackless mount.	G
A2H (high precision) to 3“/trackless mount.	H
A3H (high precision) to 3“/trackless mount.	J
B1H (high precision) to 5“/trackless mount.	K
B2H (high precision) to 5“/trackless mount.	L
C1H (high precision) to 24“/trackless mount.	M
C2H (high precision) to 24“/trackless mount.	N
D1H (high precision) to 48“/trackless mount.	P
D2H (high precision) to 48“/trackless mount.	Q
Other versions (different size, type, mounting or temperature range), add Order Code and plain text.	Z Q1 Y
Approvals	
no approval options	0

Selection and Ordering data	Order code
Further designs	
Please add „-Z“ to Order No. and specify Order code(s).	
Cable assembly for transducers (add for # of channels) See „Transducer cable selection chart“	**K..**
Cable termination kit (for one cable pair)	
• Transducer cable termination for standard and plenum cable	**T01**
Languages (Meter, Labels and Documentation)	
• German	**B10**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
Wet flow transfer calibration	
• Standard In-house 6 point calibration (up to DN 150 (6“)) available	**D10**
Tag name plate	
• Stainless steel with 12 mm characters (max 15 char.)	**Y17**
• Stainless steel with 8 mm characters (max 15 char.)	**Y19**

SITRANS FUS1020 Basic clamp-on

MLFB example

Application example

A basic clamp-on meter is required for a DN 150 (6“ schedule 40) carbon steel waste water line, with a pipe wall thickness of 7.1 mm (0.28“). Meter electronics is to be located in an instrumentation shed with available AC power. 36 m (120 ft) of transducer cable is needed to reach pipe location.

Single beam is sufficient for 3% accuracy requirement and a local display with only one 4 ... 20 mA analog output is specified.

MLFB Order No.: **7ME3570-1EA00-0NA0-Z**
K04

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Selection and Ordering data	Order-No.	Ord. code
FUS1020 meter family	7ME3570-□□□00-0□□0	□□□
IP65 (NEMA 4) enclosure	0	
Single channel	1	
Standard I/O option	E	
90 ... 240 V AC power option	A	
Transducer code for channel 1		N
Second transducer not required		A
46 m (150 ft) transducer cable		K04

Transducer selection charts

Universal transducers for any pipe material

Transducer type (universal)	Order Code	Outer diameter range (mm)		Outer diameter range (inches)	
		min.	max.	min.	max.
A2	**B**	12.7	50.8	0.5	2
B3	**C**	19	127	0.75	5
C3	**D**	51	305	2	12
D3	**E**	203	610	8	24
E2	**F**	254	6096	10	249

High precision transducers for steel pipe with outer diameter/wall thickness ratio > 10

Transducer type (high precision)	Order Code	Pipe Wall (mm)		Pipe Wall (inches)	
		min.	max.	min.	max.
A1H	**G**	0.635	1.016	0.025	0.04
A2H	**H**	1.016	1.524	0.04	0.06
A3H	**J**	1.524	2.032	0.06	0.08
B1H	**K**	2.032	3.048	0.08	0.12
B2H	**L**	3.048	4.064	0.12	0.16
C1H	**M**	4.064	5.842	0.16	0.23
C2H	**N**	5.842	8.128	0.23	0.32
D1H	**P**	8.128	11.176	0.32	0.44
D2H	**Q**	11.176	15.748	0.44	0.62

Transducer cable selection chart

Transducer cable codes for length and type options

Cable length m (ft)	Standard (PVC jacket) -40 ... + 80 °C (-40 ... +176 °F)	Plenum rated (Teflon jacket) -40 ... + 200 °C (-40 ... +392 °F)
	Order Code	
6 (20)	**K01**	**K21**
15 (50)	**K02**	**K22**
30 (100)	**K03**	**K23**
46 (150)	**K04**	**K24**
61 (200)	**K05**	**K25**
91 (300)	**K06**	**K26**

Selection and Ordering data	Order-No.
Spare parts (System)	
SITRANS FUS clamp-on	**7ME3940-** ■■■■■
Meter design	
IP65 (NEMA 4X) or IP66 (NEMA 7 Wall mount)	0
IP65 (NEMA 4) FUS1020	1
IP65 (NEMA 7) Compact	2
IP66 (NEMA 6) Weather proof portable	3
IP40 (NEMA 12) Portable	4
Power supplies, batteries and chargers	
Power supply 110 ... 230 V AC	
• for IP65 (NEMA 4X) or IP66 (NEMA7 Wall mount)	0PA00
• for FUS1020	1PA00
• for IP65 (NEMA 7) Compact	2PA00
Power supply 9 ... 36 V DC	
• for IP65 (NEMA 4X) or IP66 (NEMA7 Wall mount)	0PB00
• for FUS1020	1PB00
• negative ground for NEMA 7 Compact	2PJ00
• positive ground for NEMA 7 Compact	2PK00
Internal battery (Portable meters only)	3PP00
IP66 Portable meter charger	
• Type A for Europe (CEE7/7)	3PC00
• Type C for Australia (AS3112)	3PD00
• Type D for UK (BS1363)	3PE00
• Type J for Japan (JIS8303)	3PF00
• Type K for US (NEMA 5-15P)	3PG00
• Type L for Switzerland (SEV1011)	3PH00
IP40 Portable meter charger	
• Type A for Europe (CEE7/7)	4PC00
• Type C for Australia (AS3112)	4PD00
• Type D for UK (BS1363)	4PE00
• Type J for Japan (JIS8303)	4PF00
• Type K for US (NEMA 5-15P)	4PG00
• Type L for Switzerland (SEV1011)	4PH00
System computer modules	
Temperature module circuit board (NEMA 4X and 7 wall mount only)	0SA00
Temperature module circuit board for dual channel energy (excluding portable energy)	4SB00

Selection and Ordering data	Order-No.
Spare parts (Transducers)	
SITRANS FUS clamp-on	
Meter type	
Dedicated (FUS, FUG, FUH, FUE)	**7ME3950-** ■■■■■
Portable (FUP, FUE)	**7ME3951-** ■■■■■
Approvals (select no approvals for FUS1020 or portable transducers)	
No approval	0
FM /CSA	1
ATEX EEx ia (not for RTDs)	2
CEPAL (not for (RTDs)	3
Spare transducer code	
Liquid flow transducers	
A2 universal	LB00
B3 universal	LC00
C3 universal	LD00
D2 universal	LE00
E2 universal	LF00
A1H (high precision)	LG00
A2H (high precision)	LH00
A3H (high precision)	LJ00
B1H (high precision)	LK00
B2H (high precision)	LL00
B3H (high precision)	LT00
C1H (high precision)	LM00
C2H (high precision)	LN00
D1H (high precision)	LP00
D2H (high precision)	LQ00
D3H (high precision)	LU00
D4H (high precision)	LR00
Doppler	LS00
FUS1020 High precision liquid flow transducers	
A1H (high precision FUS1020)	LG10
A2H (high precision FUS1020)	LH10
A3H (high precision FUS1020)	LJ10
B1H (high precision FUS1020)	LK10
B2H (high precision FUS1020)	LL10
C1H (high precision FUS1020)	LM10
C2H (high precision FUS1020)	LN10
D1H (high precision FUS1020)	LP10
D2H (high precision FUS1020)	LQ10
Gas flow transducers	
B1H (high precision)	GK00
B2H (high precision)	GL00
B3H (high precision)	GT00
C1H (high precision)	GM00
C2H (high precision)	GN00
D1H (high precision)	GP00
D2H (high precision)	GQ00
D3H (high precision)	GU00
D4H (high precision)	GR00
Clamp-on RTD and thickness gauge transducers	
Standard clamp-on RTD	TA00
Submersible clamp-on RTD (not for FUP or FUE)	TB00
Thickness gauge transducer (IP66 portable)	TG00
Thickness gauge transducer (IP40 portable)	TG10

Accessories/Spare parts for clamp-on

Selection and Ordering data	Order-No.
Spare parts (Miscellaneous)	
SITRANS FUS clamp-on	**7ME3960-■■■■■**
Meter design	
IP65 (NEMA 4X) or IP66 (NEMA 7 Wall mount)	0
IP65 (NEMA 4) FUS1020	1
IP65 (NEMA 7) Compact	2
IP66 (NEMA 6) Weather proof portable	3
IP40 (NEMA 12) Portable	4
Transducer mounting hardware	
• Mounting hardware for	
- Portable Universal transducer size A or B	3MA00
- Portable high precision transducer size A or B	3MB00
- Portable Universal transducer size C, D or E	3MC00
- Portable high precision transducer size C or D	3MD00
• RTD mounting hardware for portable systems	3MR00
• Mounting hardware for	
- Dedicated Universal transducer size A or B	0MA00
- Dedicated high precision transducer size A or B	0MB00
- Dedicated Universal transducer size C, D or E	0MC00
- Dedicated high precision transducer size C or D	0MD00
• RTD mounting hardware for dedicated system	0MR00
• Spacer bar for portable transducers, size C, D or E	3MS00
• Dedicated spacer bar for pipes	
- to DN 200 (liquid), DN 600 (gas)	0MS10
- to DN 500 (liquid), DN 1200 (gas)	0MS20
- to DN 800 (liquid)	0MS30
Dedicated transducer cables (Use „Transducer cable selection chart“ to complete Order No. with ##)	
• Dedicated transducer cable code	0CK##
• FUS1020 transducer cable code	1CK##
Dedicated RTD cables (Use „RTD cable selection chart“ to complete Order No. with ##)	
• RTD cable code	0CR##
Dedicated cable termination kits	
• Termination for standard, plenum and armored transducer cable	0CT01
• Termination for submersible transducer cable	0CT11
• RTD cable termination kit for standard RTD	0CT21
• RTD cable termination kit for submersible RTD	0CT31
Ultrasonic couplants	
• Temporary water based (for portable systems) -34 ... +38 °C (-30 ... +100 °F)	0UC10
• Permanent synthetic polymer based -40 ... +190 °C (-40 ... +375 °F)	0UC20
• Permanent high temperature fluoroether -40 ... +230 °C (-40 ... +450 °F)	0UC30
Pipe damping films for FUG gas systems	
• Pipe damping film for	
- B1, B2, B3, C1 and C2 transducers	0DM10
- D1 and D3 transducers	0DM20
- D2 transducer	0DM30
- D4 transducer	0DM40

Selection and Ordering data	Order-No.
Spare parts (Miscellaneous)	
SITRANS FUS clamp-on	**7ME3960-■■■■■**
Serial RS232 Cables and I/O Adapters	
• RS232 Cable for all dedicated meters	0CS00
• RS232 Cable for IP66 Weather Proof Portabled meter	3CS00
• RS232 Cable for IP40 Portabled meter	4CS00
• I/O adapter for IP66 Weather Proof Portabled meter	3AD00
Portable (battery powered) Printers and Printer Cables	
• Portable Printer with 115 V AC charger	3PP00
• Portable Printer with 230 V AC charger	3PP10
• Serial Printer Cable for IP66 Weather Proof Portabled meter	3PC00
• Serial Printer Cable for IP40 Portabled meter	4PC00
• Thermal Printer Paper (Roll)	0PR00
Portable Meter Carrying Case	3CC00
Universal Transducer Test Blocks	
• Test Block for size A and B universal transducers	0TB10
• Test Block for size C and D universal transducers	0TB20

Transducer cable selection chart

Transducer cable codes for length and type options

Cable length m (ft)	Standard -40…+80 °C (-40…+176 °F)	Submersible -40…+80 °C (-40…+176 °F)	Plenum -40…+200 °C (-40…+392 °F)	Armored -40…+80 °C (-40…+176 °F)
	Order code			
6 (20)	**K01**	**K11**[1]	**K21**	**K31**[1]
15 (50)	**K02**	**K12**[1]	**K22**	**K32**[1]
30 (100)	**K03**	**K13**[1]	**K23**	**K33**[1]
46 (150)	**K04**	**K14**[1]	**K24**	**K34**[1]
61 (200)	**K05**	**K15**[1]	**K25**	**K35**[1]
91 (300)	**K06**	**K16**[1]	**K26**	**K36**[1]

[1] Armored or submersible transducer cable is not available for FUP1010, FUE1010 portable systems or FUS1020 systems.

RTD cable selection chart

RTD cable codes for length and type

Cable length m (ft)	Standard -40 … +200 °C (-40 … +392 °F)	Submersible -40 … +200 °C (-40 … +392 °F)
	Order code	
6 (20)	**R01**	**R11**[1]
15 (50)	**R02**	**R12**[1]
30 (100)	**R03**	**R13**[1]
46 (150)	**R04**	**R14**[1]
61 (200)	**R05**	**R15**[1]
91 (300)	**R06**	**R16**[1]

[1] Submersible RTD cable is not available for FUP1010, FUE1010 pootable systems or FUS1020 systems.